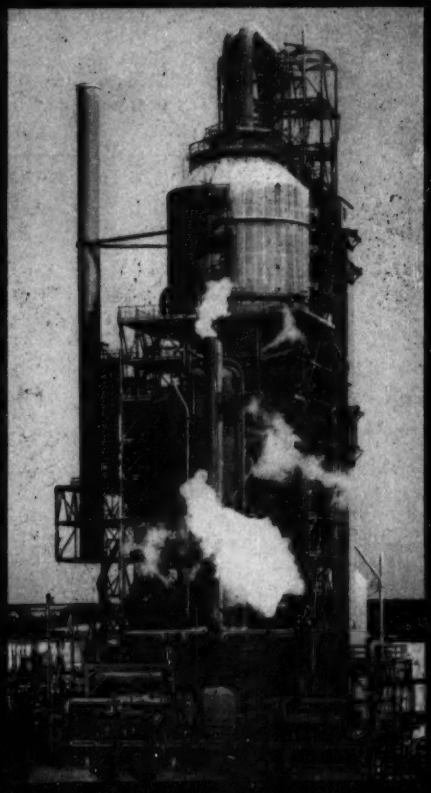
FEBRUARY
1953

Chemical Engineering



Do you know how to pick high temperature alloys?

•

Can you make and use system head curves?

•

The dollar — it's really another engineering unit.

•

Facts & figures of 1952 technological advances.

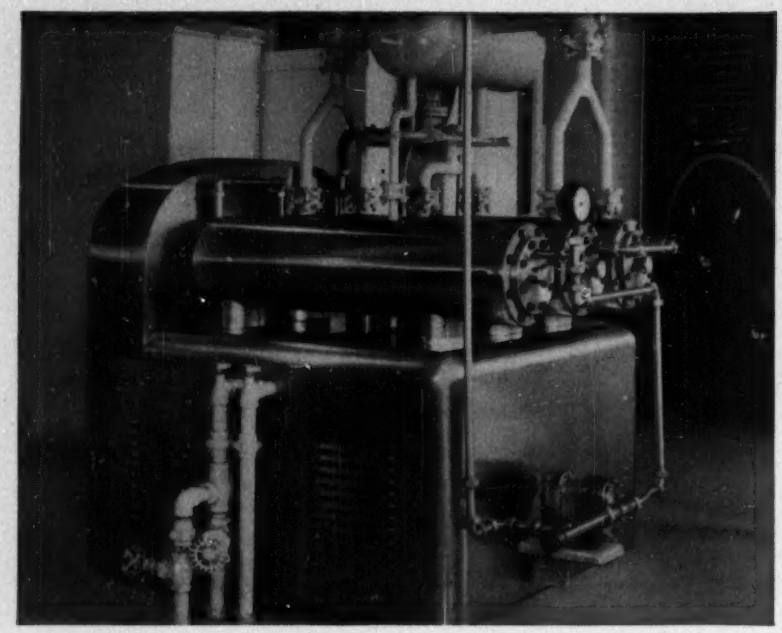
•

How does your company stack up in management training?

A McGRAW-HILL PUBLICATION

ONE DOLLAR

Girdler Process News



Norwich Pharmacal eliminates long vat-cooling with VOTATOR* Heat-transfer Apparatus

LIQUID and ointment products of The Norwich Pharmacal Company were formerly cooled and aged in large vats—for periods of days or weeks. Now continuous, closed-system processing with VOTATOR Heat-transfer Apparatus accomplishes the same operation in a matter of seconds.

This efficient processing has eliminated spoilage and saved The Norwich Pharmacal Company a great deal of valuable floor space. Automatic control assures complete uniformity of product and permits rigid quality control.

VOTATOR Heat-transfer Apparatus is widely used for cooling, heating, crystallizing, controlling heat of reaction, and many other processes. Girdler's complete service includes process engineering and design, manufacture of equipment, and installation. Call on Girdler in the planning stages of your processing facilities.

*VOTATOR—T. M. Reg. U. S. Pat. Off.

the GIRDLER Corporation

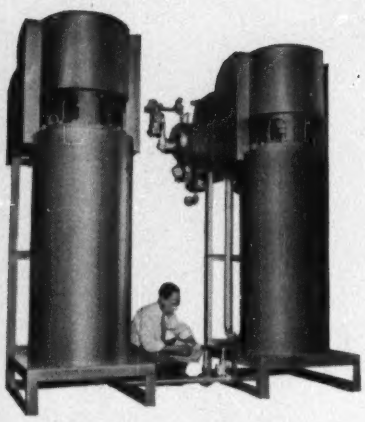
LOUISVILLE 1, KENTUCKY

Votator Division

VOTATOR DIVISION: *Processing Apparatus for the Food and Chemical Industries*

GAS PROCESSES DIVISION: *Designers, Engineers and Constructors for the Petroleum and Chemical Industries*

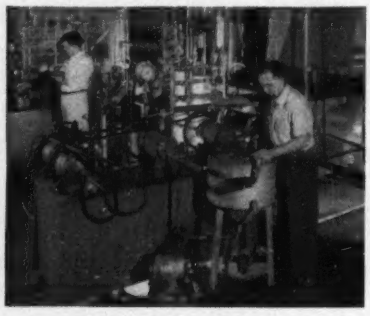
THERMEX DIVISION: *Industrial High Frequency Dielectric Heating Apparatus*



Improves Reaction Efficiency

Used as a continuous mixer and chemical reaction vessel, VOTATOR Heat-transfer Apparatus offers many advantages:

- **reactants can be injected at multiple points and gases introduced continuously.**
- **a mixture of reactants can be maintained and heat of reaction closely controlled.**
- **reaction temperatures are achieved quickly, eliminating side reactions.**
- **viscous liquids can be handled easily, and reacted product extruded.**
- **hazardous chemicals can be processed safely.**



Process Research

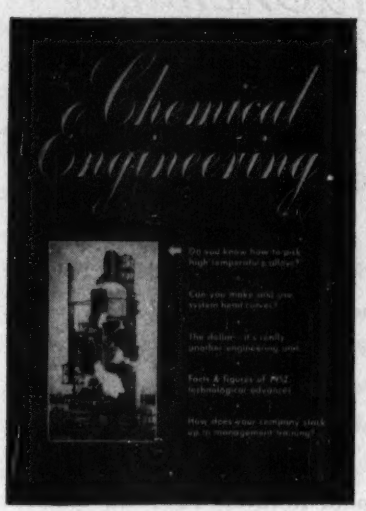
Girdler's pilot plant and laboratory facilities are available for the development of new processes and equipment, and research on new applications. Let Girdler help with your process problems.

Want Information?

Girdler's Votator Division designs and erects complete plants for processing edible oil, food, and many other products; and supplies heat-transfer equipment for continuous processing of liquid and viscous materials. Write for Bulletin V-48. The Girdler Corporation, Votator Division, Louisville 1, Kentucky. District Offices: New York, Atlanta, Chicago, San Francisco.

GUIDED TOUR

JOHN R. CALLAHAM, EDITOR



At Your Service

Most of you are familiar with the Reader Service section just inside our back cover.

But have you noticed that we've now made it more useful? Take a look, for instance, at this issue's section; it starts on p. 467.

You'll find a complete—and classified—directory to all equipment, chemicals and services offered in this issue (a total of 512 items).

And you'll find, as a reminder, a list of all the editorial items in last month's New Equipment, New Products and New Technical Literature departments (another 104 items).

So now you can use Reader Service in three ways: (1) as a complete classified directory to equipment, chemicals and services offered in each issue of CE; (2) as a quick and easy way to get more information on any of these items; (3) as a convenient way to order reprints.

. . . . How to select materials and design equipment for high temperatures.

Want the low-down on how to pick the best—and most economical—steels for high-temperature use?

Or how to specify design conditions for equipment to be used in high-temperature operations?

Then you'll find plenty of meat in this hard-headed, dollars-and-cents survey made by Foster Wheeler engineers. They use it themselves.

Pardon, your dollar's slipping!

The dollar is one engineering unit (and a mighty important one, too) that doesn't have a constant value. Your 1939 construction dollar, for example, will most likely be worth about 10 cents by 1975.

Here's an engineer's run-down of what's happening to the dollar—and what engineers can do about it (*Feature Article*).

Chalk up 797 plant projects and 292 technology advances.

That's what our CE editors came up with after they took a deep look at last year's most news-

Please turn page

FEBRUARY 1953
Chemical Engineering

GUIDED TOUR

worthy developments in chemical construction, processes and technology. You'll find the details on who, what and where in our 32-page tabulation.

Ethylene oxide process.

Vulcan Engineering takes the wraps off its novel fluidized catalyst system for direct oxidation of ethylene. It uses a vertical-tube reactor, makes it easier to control temperature and contact time (*What's Happening in Chemical Engineering*).

Bubble-cap money saver.

Engineer Loewen comes forth with a novel way to rig distilling column bubble caps that makes it a cinch to replace them. It's a plant kink that has saved Monsanto thousands of dollars (*Plant Notebook*).

Rejoin GUIDED TOUR on page 247

CHEMENTATOR 103

WHAT'S HAPPENING IN CHEMICAL ENGINEERING

New Pyridine Plant Makes MVP 112
Enrollments Are Up, Not Down 113
Shock Waves Expel Cold Fat 118
Alkyl Phosphites Now Set to Go 126
New Way to Ethylene Oxide 134
Making Sulphur Recovery Pay 138

PRO AND CON

More on Estimation of Vessel Costs 143

FEATURE ARTICLES

An Engineer's View of the Dollar 157
Sydney Steele
How to Use System-Head Curves 162
Melvin Mann
High Temperature Service 165
R. M. Braca and R. Merims

PLANT NOTEBOOK

How to Rig Bubble Caps for Easier Replacements 172
Roland P. Loewen

FEATURE REPORT

Plants & Processes 175
New Plants and Facilities Underway in 1952 176
New Processes and Technology, 1951-52 194

PROCESS EQUIPMENT NEWS

Burner Reflects New Theory 208

Rotary Pump Resists Wear 212

Flash Points in a Flash 220

PRODUCT NEWS

Plants Flourish on Frit 228

PICTURED FLOWSHEET

Sodium Ferrocyanide 240

YOU AND YOUR JOB

Why All the Fuss About Executive Development? 248

CORROSION FORUM

Lead and Lead Alloys 264
Kempton H. Roll

QUOTES, EXTRACTS AND DIGESTS

Where to Use Synthetic Greases 307

Why Monsanto Makes a Profit 316

CHEMICAL ECONOMICS

More Chemicals for Textiles 359

TOMORROW'S TECHNOLOGY

Separate Your Solid Solutions 368

Silica Gel Removes Aromatics 374

Your Checklist of New Patents 376

OTHER DEPARTMENTS

Book Reviews 340

Convention Calendar 112

Industrial Notes 298

Industry Trends 364

Names In the News 284

New Technical Literature 348

Recent Pamphlets 344

Reader Service Section 467

STAFF

Publisher ..... Wallace F. Traendly
Editorial Director ..... Sidney D. Kirkpatrick
Editor ..... John R. Callaham
Managing Editor ..... Lester B. Pope
Senior Associate Editor ..... Theodore R. Olive
Associate Editor ..... Cecil H. Chilton
Associate Editor ..... Morgan M. Hoover
Assistant Editor ..... Calvin S. Cronan
Assistant Editor ..... Richard V. Reeves
Assistant Editor ..... Edward T. Thompson
News Editor ..... Joseph A. O'Connor
Editorial Assistant ..... Frances Arne
Editorial Assistant ..... A. J. O'Brien, Jr.
Art Editor ..... Margaret Redfield
Midwest Editor ..... Frank C. Byrnes
Southwest Editor ..... James A. Lee
Western Editor ..... Elliot Schrier
Washington Editors ..... R. S. McBride
G. S. Bryant, Jr., John Kent

CHEMICAL ENGINEERING

February 1953 Vol. 60—No. 2

Published monthly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. Publication Office: 99-129 North Broadway, Albany 1, N. Y.

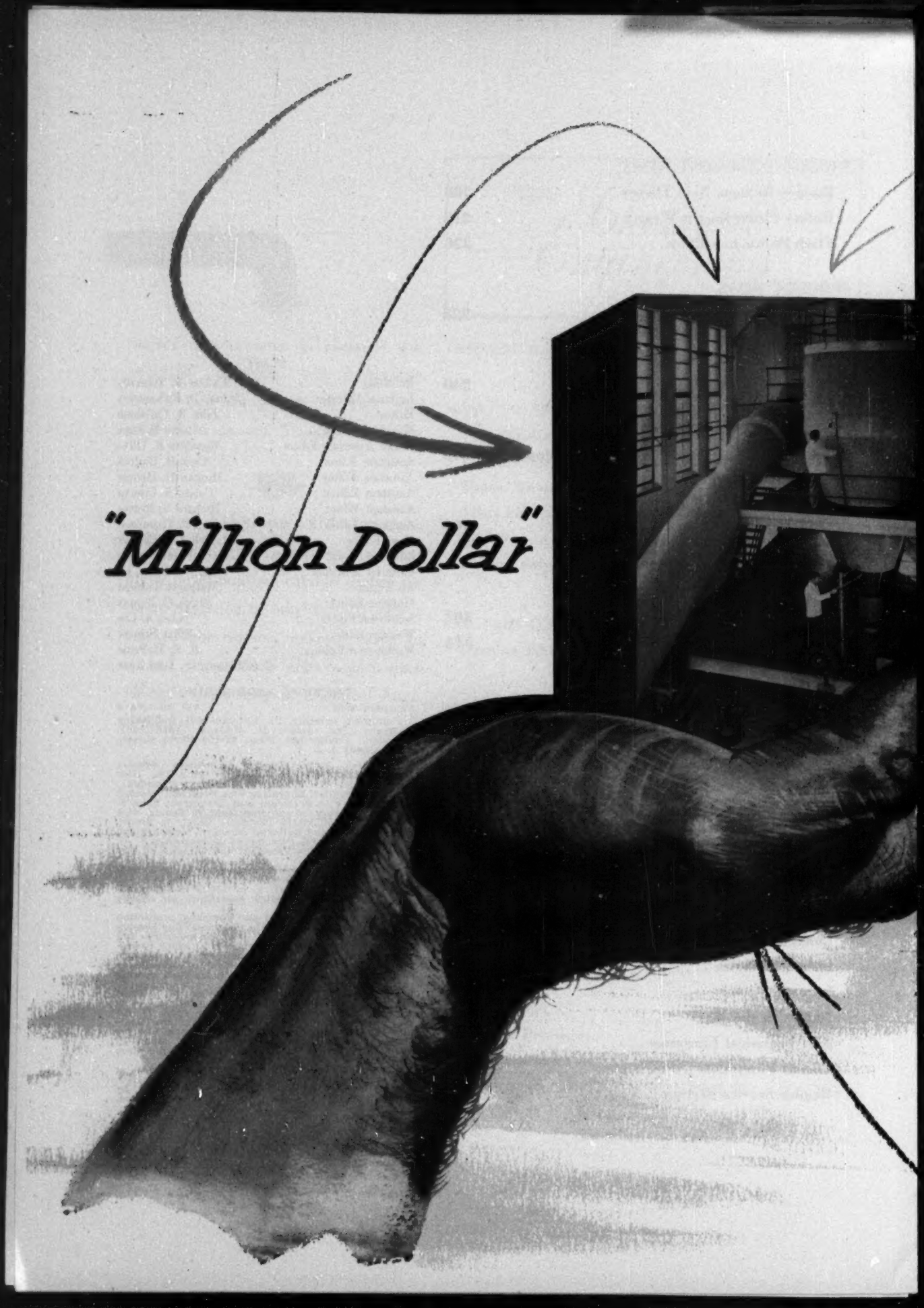
▶ **Executive, Editorial and Advertising Offices:** McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

▶ **Subscriptions:** Address correspondence to Chemical Engineering—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow one month for change of address.

Please indicate position and company connection on all subscription orders. Chemical Engineering solicits subscriptions only from supervisory and engineering personnel in companies in which chemical engineering and processing form an important part of the total operation and from consultants and laboratories whose field includes such process industries.

▶ **Subscription Rates:** Single copies $1. United States and possessions, $3 per year, $4 for two years, $5 for three years; Canada, $4 per year, $6 for two years, $8 for three years; other Western Hemisphere, $15 per year, $25 for two years, $30 for three years; all other countries, single copies $2 each, $20 per year, $30 for two years, $40 for three years.

Entered as second-class matter Sept. 3, 1936, at Post Office at Albany, N. Y., under act of March 3, 1879. Printed in U. S. A. Copyright 1953 by McGraw-Hill Publishing Co., All Rights Reserved.


"Million Dollar"

Can spray drying give your product a new form, more markets, or a big boost in profit potentials? Does your product have a chance to share in these exciting new advancements? The answer could be yes! Swenson spray drying research has helped many leading companies climb to new sales records. The list includes such fast moving money makers as instant coffee, plastic powders, paper coating materials, antibiotic fermentation residues, and petroleum catalysts.

Next could be your own product! The quickest way to find out is to test it in the Swenson *full-size* spray dryer. You'll get the facts . . . and you'll get the benefit of experienced analysis and engineering by the leader in spray drying advancements. Talk spray drying with Swenson today!

Magic For Your Product!

PRODUCTION BASIS TESTING FOR FACTS - NOT GUESSWORK!

The Swenson Research Laboratory Spray Dryer is commercial-size . . . the results you get from experimental tests, in barrel or carload lots, will match those of actual production conditions. You'll know the facts before major investment is required!

ENGINEERING THAT HELPS YOU PLAN FOR PROFITS!

Get the benefit of Swenson's combined experience in hundreds of successful spray drying applications! Swenson representatives are engineers equipped to help you in every phase of the spray drying problem . . . analysis, layout, design and manufacture of equipment and initial supervision of the job!

SWENSON EVAPORATOR COMPANY
15669 Lathrop Avenue • Harvey, Illinois

SWENSON

Proved Engineering for the Process Industries
SINCE 1889

A DIVISION OF WHITING CORPORATION

Evaporators

Spray Dryers

Crystallizers

Filters

Your WATCHDOG COMMITTEE on COSTS will approve

SHOP FABRICATION OF PIPING

because . . . both quality and economy are guaranteed. Piping is fabricated in Grinnell shops under ideal conditions, with modern equipment, by personnel qualified in all classes of work. Price (determined in advance) includes competent engineering, scheduling and shop sketches, efficient material procurement. Grinnell supplies heat, light, power, water, compressed air, expendable tools and supplies. Grinnell shops have large storage areas for pipe and completed assemblies, expensive modern equipment, a permanent staff of skilled workers. Grinnell finances material inventories and payrolls; carries insurance. The customer pays for no waste material or spoilage. Shop fabricated piping is rigidly inspected and tested to meet exacting requirements of customer's specifications and applicable codes. It is cleaned inside and outside and painted. Squared to standard dimensional tolerances, sub-assemblies are erected at the job site more quickly and easily. It all adds up to this . . . shop fabrication by Grinnell guarantees quality and economy.

Write for complete facts.

GRINNELL

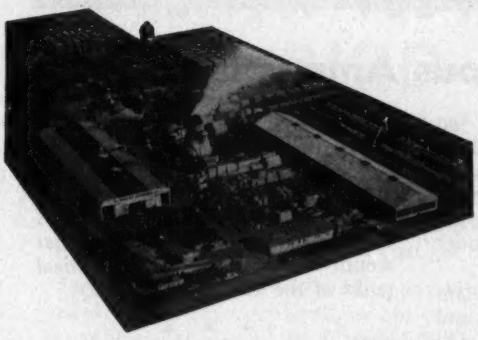
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

look to MARLEY for...

...ASSEMBLY-LINE production of Giant Cooling Towers



Marley Company plant at Stockton, California—the world's largest prefabricating plant for production of water cooling towers.

At Stockton, California, the Marley Company operates the largest specialized manufacturing plant in the world for prefabricating cooling tower lumber. Here millions of feet of redwood are prefabricated with assembly-line speed, made possible by the most modern equipment and manufacturing techniques.

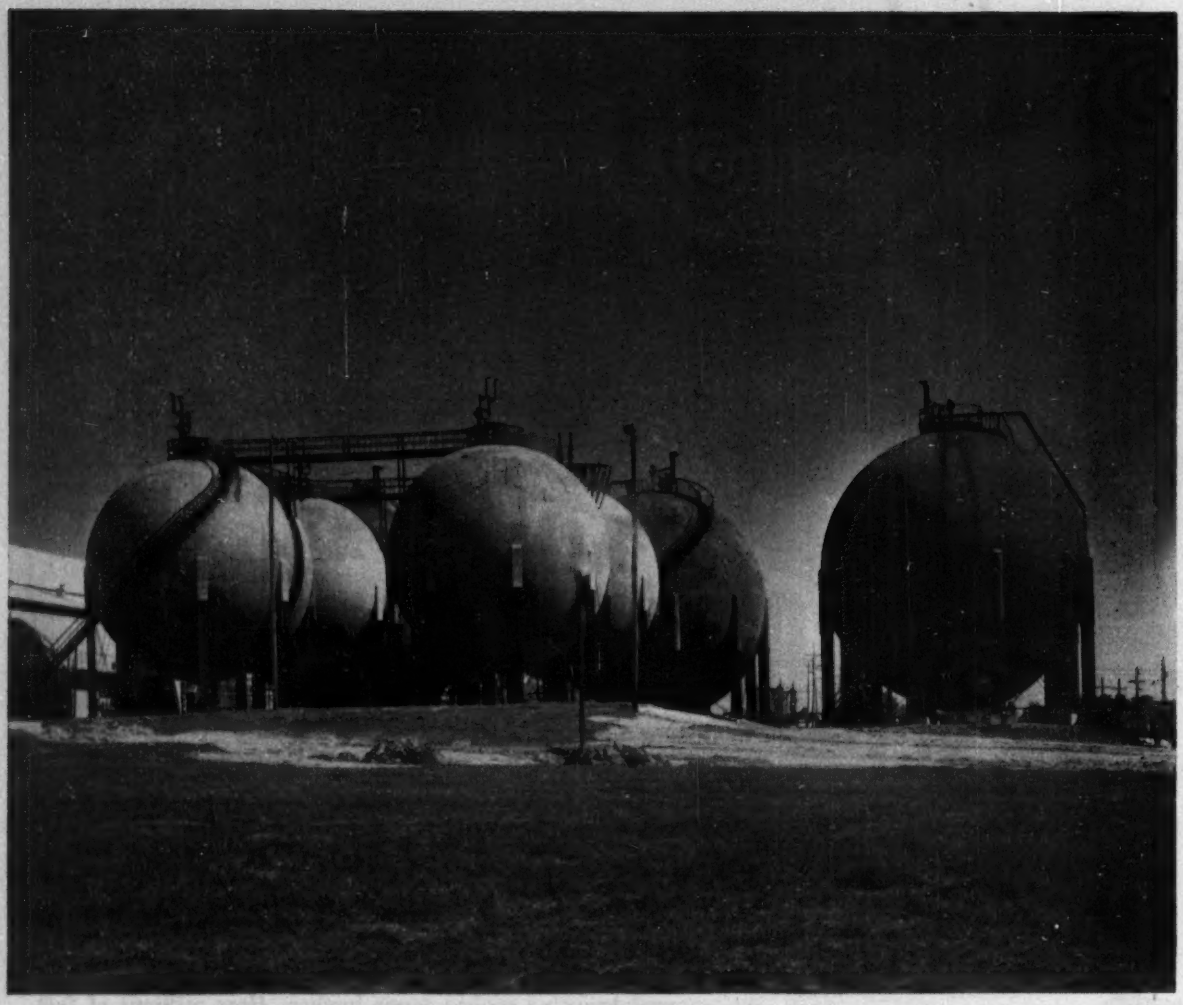
Hundreds, perhaps thousands, of miles from Stockton, giant Marley cooling towers are erected on the same assembly-line basis. "Prefab" lumber, made to exact engineering specifications, goes into its place in these large towers. Everything fits. There's no time lost.

If you need large water cooling towers, and want to get them into service as quickly as possible, call on the Marley Company. You'll enjoy all the advantages of Marley's "custom-built" engineering, combined with assembly-line methods—advantages that have made Marley the world's leading producer of water cooling towers.

MARLEY

The Marley Company

Kansas City 5, Missouri



Modern Storage for Anhydrous Ammonia

The Lion Oil Company has been increasing the storage facilities for anhydrous ammonia at its petrochemical plant in El Dorado, Arkansas, since the original installation of four 5,000-bbl. Hortonspheres in 1942. Supplementary installation consist of two 12,000-bbl. Hortonspheres in 1948 and four 12,000-bbl. Hortonspheres in 1950.

Natural gas, air, and water is fed into Lion's petrochemical plant at El Dorado to produce huge tonnages of nitrogen products. Daily production in the plant is approximately 98 tons of anhydrous ammonia, 376 tons of three types of nitrogen solutions, 380 tons of ammonium nitrate fertilizer, 380 tons of sulfate of ammonia, 20 tons of aqua ammonia and 12 tons of sulfuric acid. (Figures shown are quantities produced for sale under capacity production.)

When storing anhydrous ammonia, pressure obtains the best and most economical results. Lion Oil Company selected Hortonspheres for storage of their anhydrous ammonia because Hortonspheres are built to withstand the internal pressure that results from high volatility. They are engineered for simplicity and compactness. Only one set of pipe connections and fittings are required for each tank. Industries that are cramped for ground area find that the space required for installation of a Hortonsphere is far less than what would be necessary for cylindrical tanks of the same total capacity.

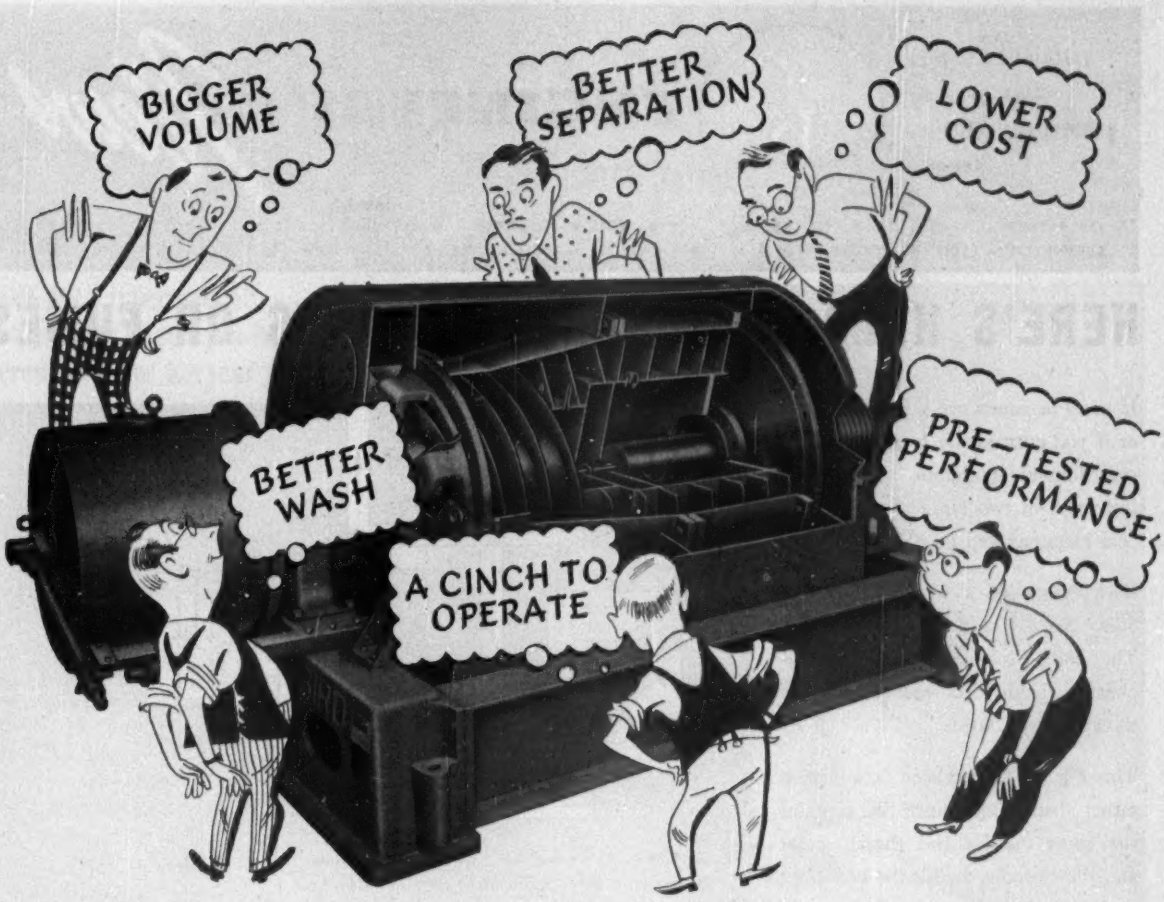
• • •

The versatile Hortonsphere has many uses in many industries. To obtain further information concerning this product write our nearest office for Bulletin F. There is no obligation on your part.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3 . . . . . 2120 Healey Bldg.
Birmingham 1 . . . . . 1510 North Fiftieth St.
Boston 10 . . . . . 1005-201 Devonshire St.
Chicago 4 . . . . . 2124 McCormick Bldg.
Cleveland 15 . . . . . 2220 Guildhall Bldg.
Detroit 26 . . . . . 1503 Lafayette Bldg.
Havana . . . . . 402 Abreu Bldg.
Houston 2 . . . . . 2103 C & I Bldg.
Los Angeles 17 . . 1505 General Petroleum Bldg.
New York 6 . . . . . 3318—165 Broadway Bldg.
Philadelphia 3 . . . 1625—1700 Walnut St. Bldg.
San Francisco 4 . . . . . 1522—200 Bush St.
Seattle 1 . . . . . 1305 Henry Bldg.
Tulsa 3 . . . . . 1623 Hunt Bldg.
Washington, D. C. . . . . 1160 Cafritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA



Whatever You're Looking For In A Filter This BIRD May Be Your Best Bet

CAPACITY — Bird Continuous Centrifugal Filter users are finding the BIRD the profitable way to filter whether processing a couple of hundred pounds per hour or a ton a minute. Birds are built in a number of sizes. Filtering cost per ton is low.

SEPARATING EFFICIENCY—Most anything that can be settled and compacted by the application of centrifugal force can be filtered efficiently by the BIRD. Solids may be a fraction of a micron or half inch size. Feed slurries may range from a per cent or two solids to thickener underflows, and may be hot or cold.

OPERATING SIMPLICITY—Requires no crew of experts; readily adaptable to full automatic control.

WASHING EFFICIENCY—In the BIRD you can get a thorough wash with minimum quantity of wash liquor.

ECONOMY — Cost of installation, operation and maintenance is low. Less floor space is required than for any other filter, capacity being equal. There are no filter media to wash, repair or renew.

PRE-TESTED AND PROVED PERFORMANCE — You don't have to gamble on whether the BIRD is the best bet for your particular product, production and operating conditions. The Bird Research and Development Center gets you the facts and figures, pilot plant scale, *before* you spend your money. Simply put the burden of proof on us.

BIRD MACHINE COMPANY

SOUTH WALPOLE • MASSACHUSETTS

HERE'S HELP IN SCRUBBING GASES OR FUMES

If gases or fumes are a plant problem or if you must satisfy local ordinances regarding air pollution, you will be interested in two types of Gas Scrubbers manufactured by SK.

Both consist of a scrubber box, SK Spray Nozzles, and SK Throat Pieces. The box, which encloses the components, is divided into "banks" as shown in Fig. 4031.

The Fig. 4030 Scrubber is a system rather than a unit since SK supplies the spray nozzles and throat pieces and the customer builds the box from sheet metal, cement, wood, or other material which fits his needs.

The Fig. 4031 Scrubber, illustrated, is a "packaged" unit which includes an integral separator for separating spray liquid after scrubbing.

Both operate on the same principle to handle and wash gases of varying types. As gas enters each bank, it is entrained and forced through the throat pieces into succeeding banks by the spray action of the liquid from the nozzles. High scrubbing efficiency, as much as 98 to 99-plus per cent, can be realized since gas cannot by-pass the spray and thorough mixing occurs. Fig. 4031 illustrates this operation. The number of nozzles, throat pieces, and banks are determined by the volume and characteristics of the gas and the efficiency desired.

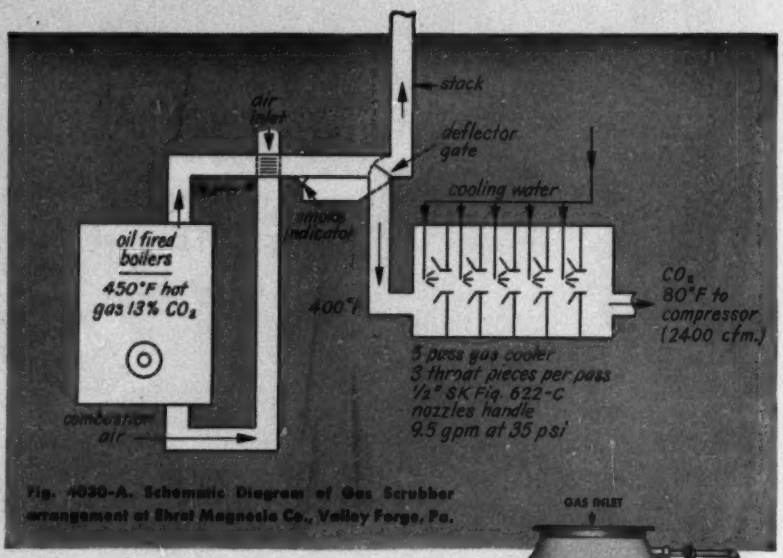


Fig. 4030-A. Schematic Diagram of Gas Scrubber arrangement at Ehret Magnesia Co., Valley Forge, Pa.

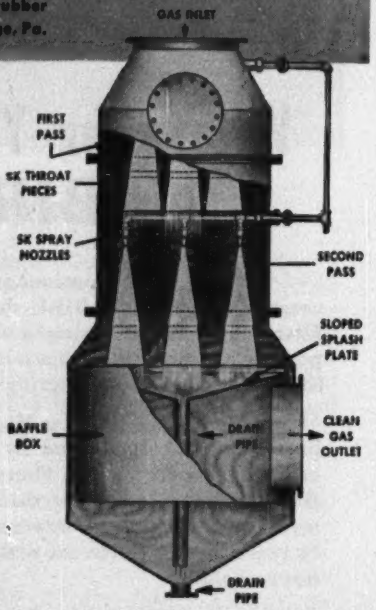
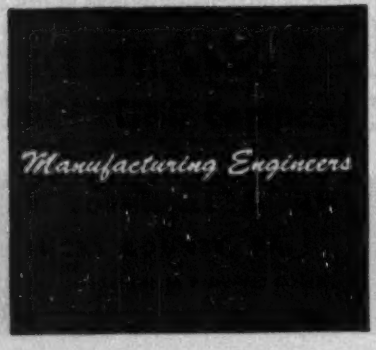


FIG. 4031. SK "Packaged" Gas Scrubber Unit

Illustration, Fig. 4030-A, shows a system employing an SK Fig. 4030 Gas Scrubber in use at Ehret Magnesia Manufacturing Co.'s new plant at Valley Forge, Pa. This system is being used to wash and cool carbon dioxide gases from oil-fired boilers for later use in the company's magnesia carbonation process.

Complete information on SK Gas Scrubbers is contained in new Bulletin Supplement 4-RA. Request a copy.



SK Rotameters are simple, accurate and convenient rate of flow measuring devices designed and built in a variety of types and sizes for diverse applications. Bulletin 18-RA pictures and briefly describes all types of SK Rotameters and lists, by number, the detailed bulletin relating to each. Send for your copy of Bulletin 18-RA today.

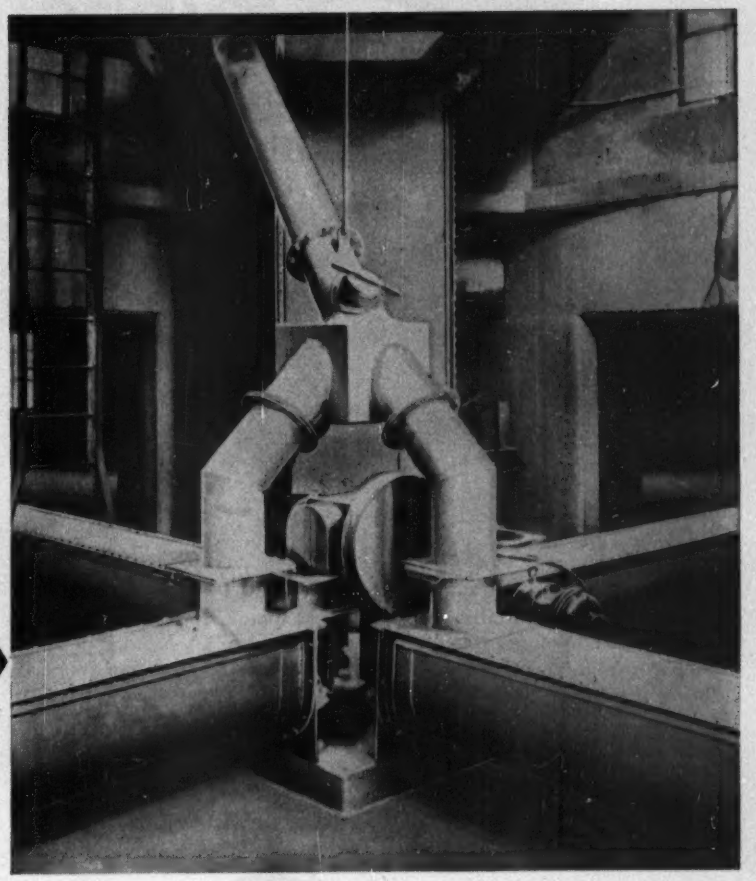
Why LINK-BELT "total engineering" means better screw conveyors for you...

LINK-BELT integrates all components to give you the right screw conveyor for your job

Don't be fooled by the apparent simplicity of a screw conveyor. It *is* simple in design, but there are many important factors that must be considered to give you top performance.

That's why Link-Belt's broad materials handling experience is so important... why Link-Belt Screw Conveyors are first choice on so many demanding jobs. And because Link-Belt makes all types and sizes of components, you get exactly the right screw conveyor for your particular requirements.

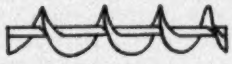
It's easy to see why "total engineering" results in top screw conveyor performance. Call the Link-Belt office near you for complete information.



Four Link-Belt Helicoid Screw Conveyors distribute material from Link-Belt Bucket Elevator discharge.

LINK-BELT designs and builds all components!

SCREWS—Link-Belt makes a complete range of conveyor screws—Helicoid, Sectional Flight, Cut Flight, Ribbon Flight, Paddle type and special

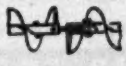


types for such diverse applications as feeding, conveying, mixing, agitating, stirring, blending, etc.

HANGERS—Available in a variety of styles and mountings, with various bearing materials, and steel or cast hanger frames.

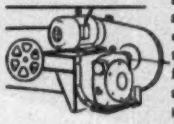
TROUGHS—Link-Belt builds flanged, angle flanged, flared, rectangular, dust-seal, jacketed and drop-bottom types in steel or alloy metals. Variety of connections, supports, covers and clamps offers added design flexibility.

SPOUTS & GATES—Plain discharge spouts can be fixed or detachable. Discharge gates, flat or curved slide, can be hand or rack-and-pinion operated.



SHAFTS & COUPLINGS—Conveyor couplings and end shafts are designed for adequate torsional strength and have jig-drilled coupling bolt holes for accurate alignment.

TROUGH ENDS—Steel or alloy metal plate or cast trough ends to match all trough shapes, provide required shaft bearing support and alignment. Seal glands to protect bearings, if required.



DRIVES: Link-Belt designs and builds many forms of drives to suit specific conditions—enclosed gear, Electro-fluid, P.I.V. variable speed, and chain drives of various types.

Link-Belt can also supply a full range of flanges, thrusts, covers, saddles and countershaft ends

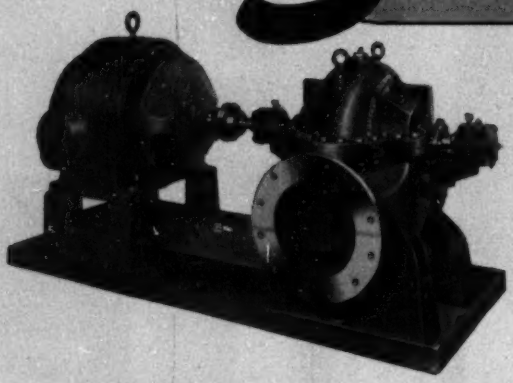
LINK-BELT

SCREW CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12,088

"Buffalo" *Tips on Better Pumping*

3 TYPES of PUMPS and what each offers you —



1. DOUBLE SUCTION

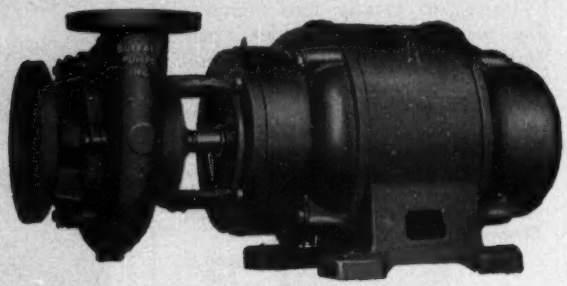
This "Buffalo" Pump offers a high degree of efficiency in pumping large volumes of clear water. Available in capacities for 10 to 10,000 gpm at up to 300 ft., these pumps are hydraulically balanced — water entering both sides of the impeller in equal volume and pressure. Bearings on each end of shaft mean extra long wear. Horizontally divided casing makes for extreme accessibility in inspection and servicing.

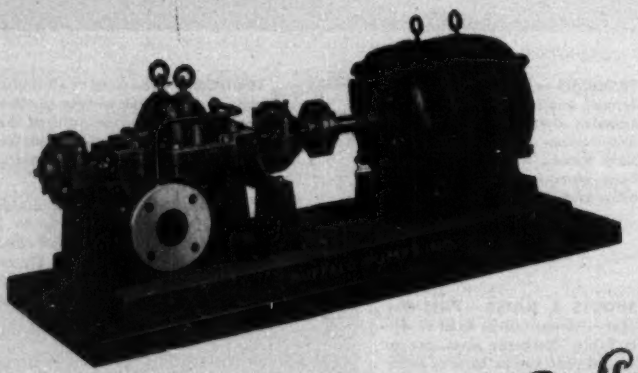
Full details in BULLETIN 955-P.

2. CLOSE-COUPLED

Here is a ruggedly compact pump for those "close-quarters" installations. Pump and motor are rigidly mounted together with impeller on motor shaft, which means *permanent alignment*. "Buffalo" builds these pumps in a variety of alloys for specific liquids, with threaded or flanged inlets and outlets. Pump casing may be rotated, or removed for inspection—an important maintenance factor.

WRITE for BULLETIN 975-B.





3. MULTI-STAGE

Each extra stage adds pressure! That's why pumps like these "Buffalo" Type "RR" (2 and 4-stage models) operate efficiently against high pressures (500 psi or 1500 ft. heads). These "Buffalo" Pumps have proven themselves very durable in boiler feed and other clear water installations. Bearing support on both ends of the shaft —rugged, horizontally divided casing—solid, rigid base—all contribute to easy maintenance and long life.

For further details, write for Bulletin 980-B.

BUFFALO "Buffalo" PUMPS, INC.

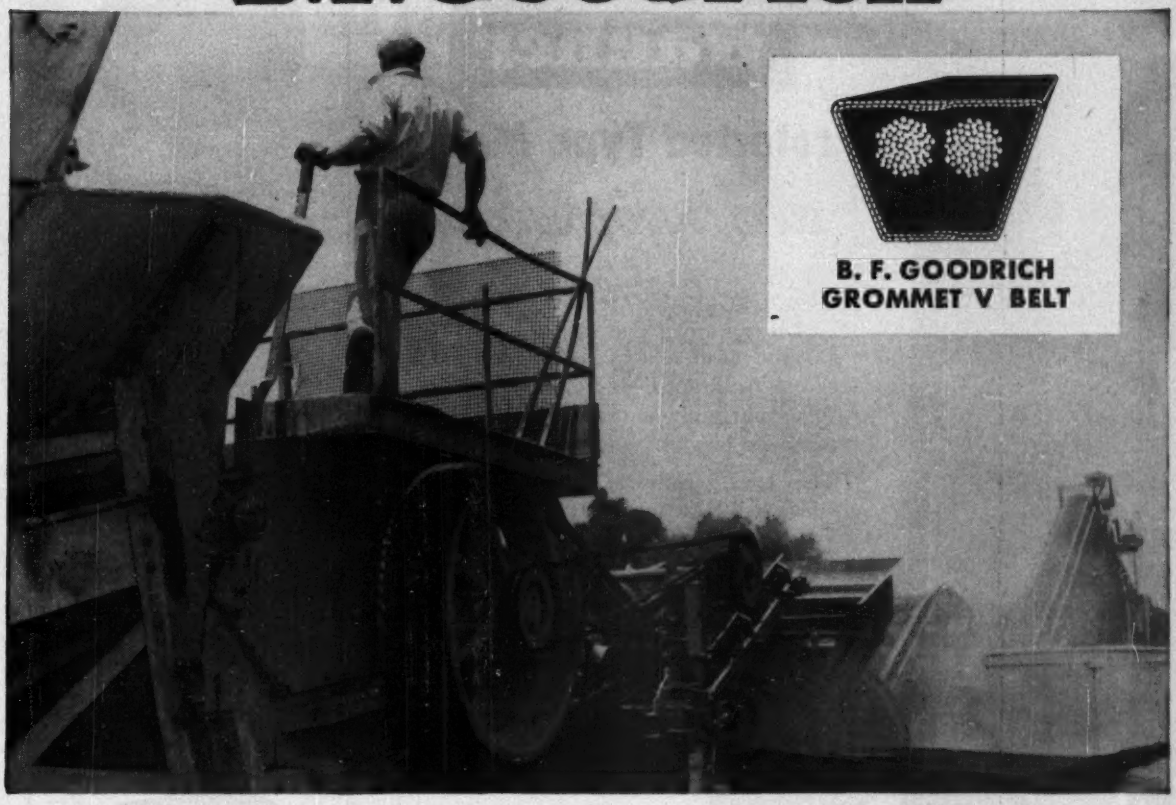
501 BROADWAY BUFFALO, N. Y.

Subsidiary of Buffalo Forge Company

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Where failures meant shutdowns they changed to grommet belts

B. F. Goodrich grommet V belts last 20 to 50% longer

Crushing rock puts terrific shock loads on the V belts that drive the crusher. When the drive stops because of premature belt failure, the whole operation shuts down, deliveries are delayed. The stone company wanted reliability—and got it—when a set of B. F. Goodrich grommet V belts was installed. In spite of the shaking, jolting action, the grommet V belts on this crusher have already given two years of trouble-free service, and are still in excellent condition. Here's why B. F. Goodrich grommet V belts outlast and outperform ordinary belts.

No cord ends

A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength

All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. There are no layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet V belts stretch less—only ⅓ as much, on an average, as ordinary V belts.

Better grip, less slip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

They cost no more

Grommet V belts cut costs because they last longer, increase production because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet they cost not one cent more. Available in C, D and E sections. But remember, only B. F. Goodrich makes the grommet V belt (U. S. Patent No. 2,233,294), so to get all these savings, call in your local BFG distributor the next time you need V belts, or write *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

Grommet V-Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

Wagner

Protected Type Motors

solve tough production problems

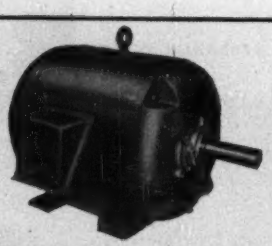
Do you need motors to operate under severe conditions? If you do—you can solve your problem easily with Wagner's complete line of protected type motors.

They are specifically designed for use wherever EXTRA protection is demanded —for bearings or windings . . . against corrosive vapors or abrasive dusts . . . in explosive atmospheres or in exposed outdoor locations.

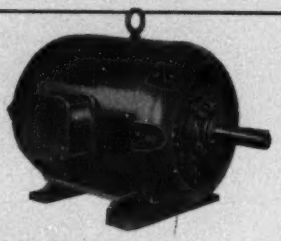
In their specific applications, each of these Wagner Motors assures complete protection of vital parts. Wagner Motors are backed by more than sixty years of motor building experience.

* * *

A Wagner engineer will be glad to help you select the correct motor for *your* specific application. Consult the nearest of our 32 branch offices, or write for Bulletin MU-185 for complete information.

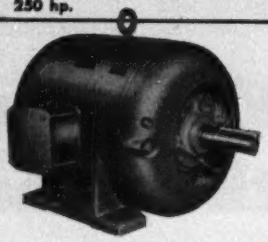


TYPE CP—Totally-enclosed Fan-cooled. Steel frame. 1 to 250 hp.



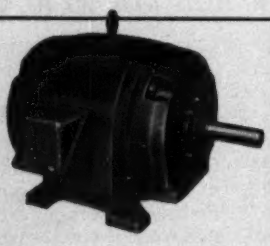
TYPE HP—Explosion-proof. Steel frame. 1 to 250 hp.

TYPE EP—Totally-enclosed Fan-cooled. Cast iron frame. 2 to 250 hp.

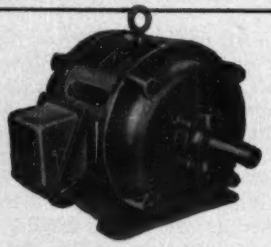


TYPE JP—Explosion-proof. Cast iron frame. 2 to 250 hp.

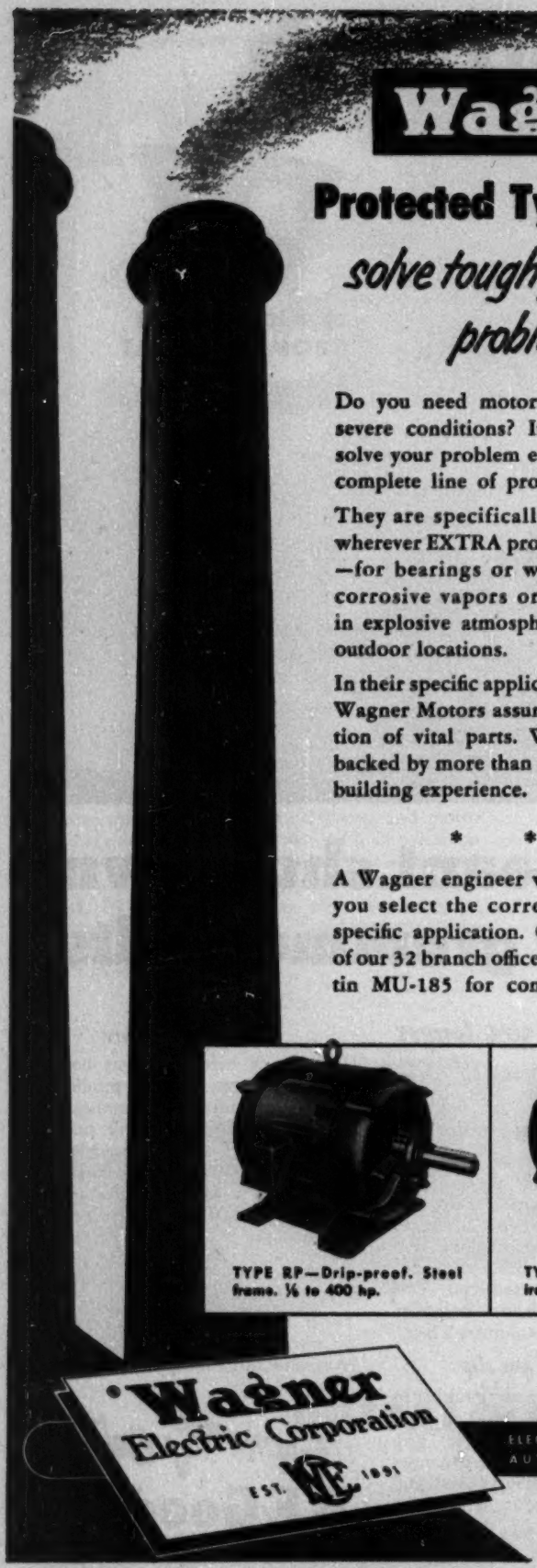
TYPE RP—Drip-proof. Steel frame. ½ to 400 hp.



TYPE XP—Splash-proof. Cast iron frame. ¾ to 200 hp.



TYPE TP—Totally-enclosed, non-ventilated. ¼ to 15 hp.



WAGNER ELECTRIC CORPORATION
6407 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

M53-10

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Company does not make these nuts and bolts. We supply raw materials for the coatings only.

Cost 86% less

—and corrosion-proof too!

IT took a rayon processing problem and an alert manufacturer—plus versatile Geon paste resin—to develop these new, money-saving, vinyl-encased bolts and nuts*. Made of low carbon steel, the bolt head and the nut are coated with a vinyl plastisol made from Geon paste resin to fight corrosion.

They replace expensive stainless steel bolts and nuts and special sealing gaskets.

Just see the savings for this rayon manufacturer! The Geon-coated parts cost about 86 per cent less. They're far more resistant to chemical attack. A full year's experience shows that they maintain a permanently liquid-tight seal, and that the vinyl coating effectively protects the metal against corrosion.

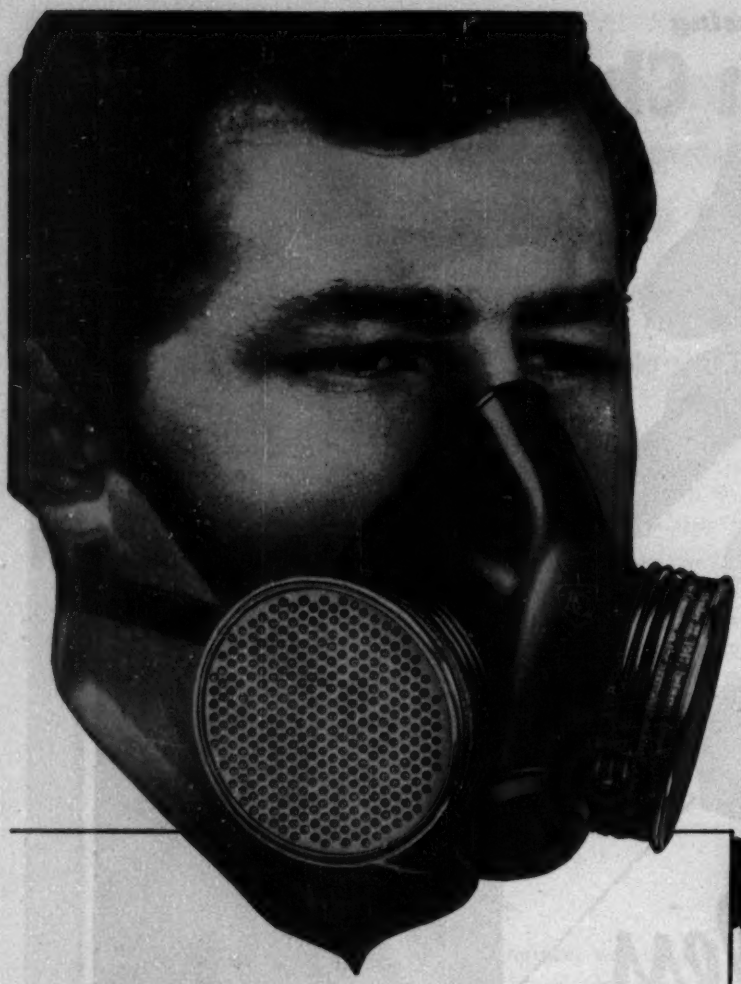
*Patent applied for

What Geon paste resin does here is typical of the many improvements it helps make possible. For Geon materials have exceptional resistance to heat, cold and abrasion, aging, many chemicals and other damaging conditions. And with Geon based plastisols, no expensive solvents or recovery systems are needed. There's no fire hazard. Manufacturing costs are substantially reduced.

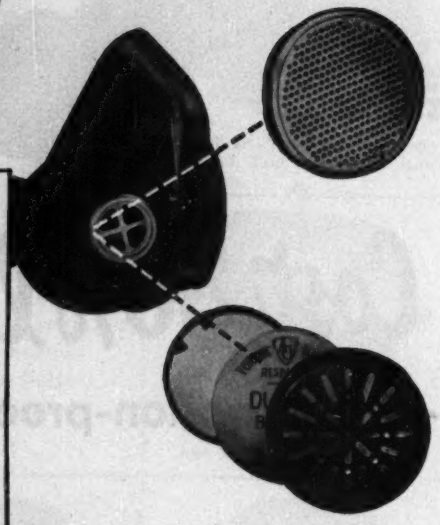
Geon materials—resin, latex or compounded plastics—may help you improve or develop a product. For technical bulletins and helpful advice, please write Dept. GE-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



NEW
AO
RESPIRATOR
LINE



Pay for ONE Facepiece,
GET 7 TYPES OF PROTECTION
with the AO R5000!

Yes, due to quick interchangeability of its threaded cartridges and disc type filter, the AO R5000 line of TWIN CARTRIDGE RESPIRATORS permits you to standardize on one respirator in protecting your workers against the multitude of dust, vapor and gas hazards commonly met with in industry. Remember, there's only one facepiece to stock and the R5000 offers greater visual area and many advanced construction features that mean added safety and comfort. Ask your nearest AO Safety Products Representative for the R5000. Tell him the respiratory hazards encountered in your operations and he will recommend the disc type filter and/or cartridges required.

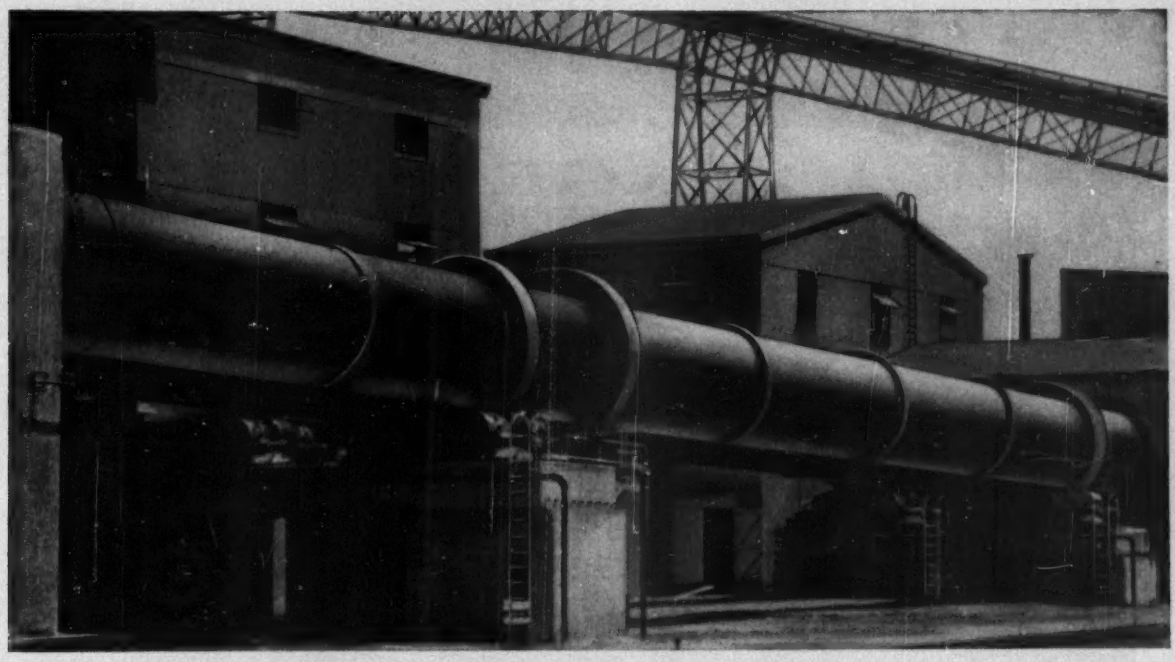
QUICK, EASY INTERCHANGING!

Retainer assembly accommodates both chemical cartridges and AO disc type filter — the small chemically treated filter that gives 40 times the dust protection of untreated filters. The cartridges screw in — assures a positive gas-tight seal. The felt filters stay put safely by a cover that screws onto retainer assembly.

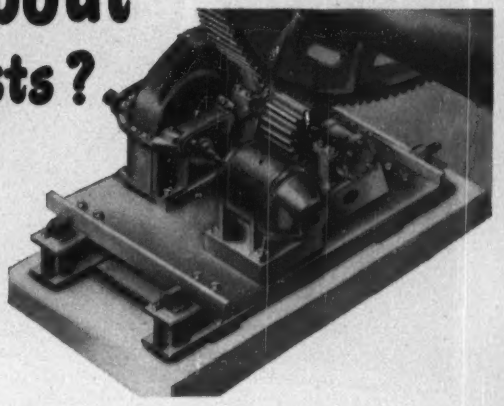
American Optical
SAFETY PRODUCTS DIVISION

Dust Filter and Organic Vapor Cartridges, Combinations of both, and Metal Fume Cartridges Approved by the U. S. Bureau of Mines

Southbridge, Massachusetts • Branches in Principal Cities



Are you concerned about high thermo-processing costs?



Then it's time to replace inefficient machines with Traylor Rotary Kilns

Traylor Rotary Kilns have many exclusive features which were developed over the past 50 years on the basis of field experience.

Solid cast steel floating riding rings, which are mounted on machined blocks, insuring a perfect fit. This eliminates uneven wear which causes weak spots that result in expensive maintenance.

Kiln drive is completely mounted on a sole plate which is fully adjustable as a unit to insure perfect alignment and easy adjustment of main gear and pinion.

Secondary air is utilized to obtain maximum heat efficiency from every B.T.U. This Traylor feature achieves amazing thermo-processing economies.

The success of Traylor Rotary Kiln design is best emphasized by the large number of customers who have returned time after time for additional Traylor Kilns. Send for Bulletin 115 which gives all the points of Traylor superiority.

a **Traylor** *leads to greater profits*

TRAYLOR ENGINEERING & MANUFACTURING CO.
511 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

Send 8 page catalog on Traylor equipment for the process industries.

Name:_____

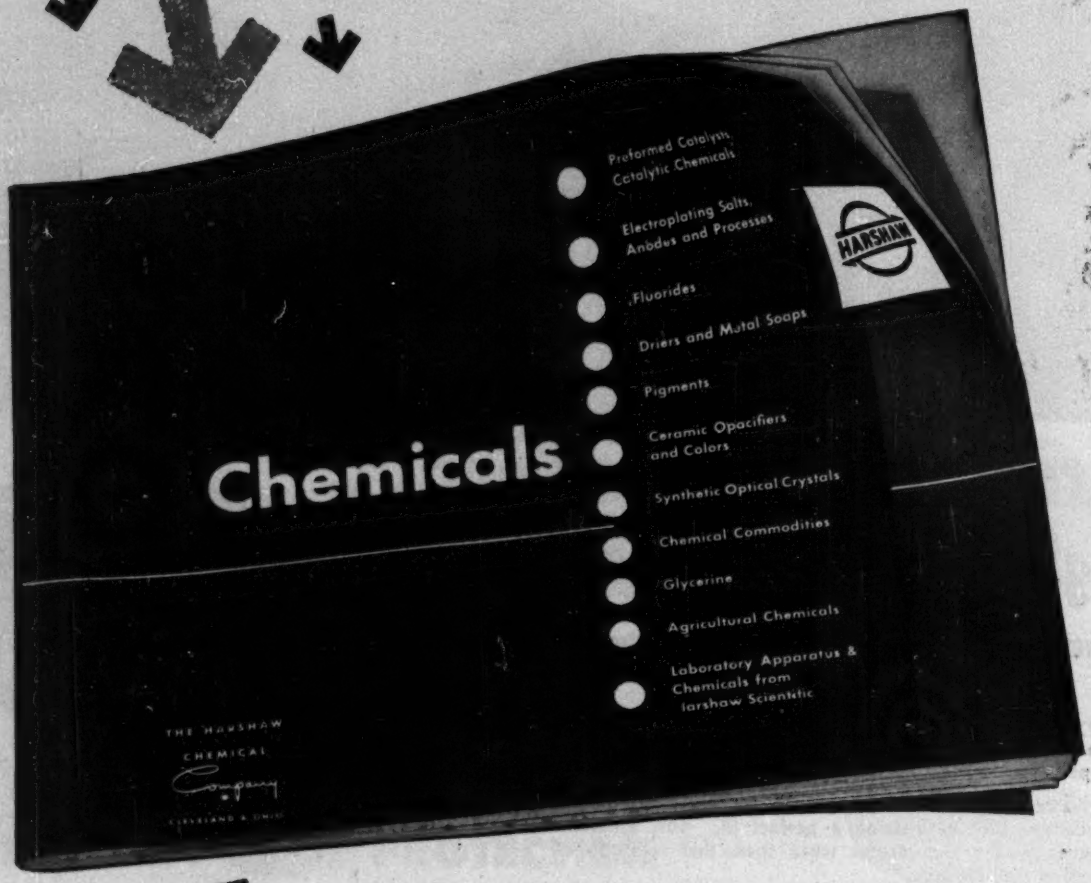
Position:_____

Company:_____

Address:_____ State:_____

WRITE FOR THIS FREE

16 PAGE BOOK...



This 16 page illustrated booklet describes the major activities of The Harshaw Chemical Co. It lists manufactured items and offers booklets which furnish more specific information about these Harshaw products.

THE HARSHAW CHEMICAL COMPANY
1945 East 97th Street, Cleveland 6, Ohio

Send me a copy of your booklet
"Harshaw Chemicals for Industry and Laboratory"

MY NAME _____ (Please Print)

CO. NAME _____

STREET ADDRESS _____

CITY _____ ZONE _____ STATE _____

THE *Harshaw* CHEMICAL COMPANY
CLEVELAND 6, OHIO

Her fingertips imagine the taste

The lady doesn't trust her eyes alone.

The buyer of Multiwalls is in much the same position.

Aside from package design, it's hard to tell one manufacturer's bag from another's simply by looking at it or fingering it.

Put the bags out of sight and you may be able to see many differences.

Men who buy 85 per cent of all Multiwalls consider* these intangibles more important than any other factor when they choose their supplier.

Invariably, these are among the first questions they ask . . .

"Is this company big enough?"

"Do they have a fair allocation policy?"

"Are their prices competitive?"

"Do they respect delivery dates?"

In a nutshell—

"Are they good people to do business with?"

We can't tell you what the answers are when these Multiwall users consider Union. This we do know . . . and the inference is yours to make—

In these days of industrial pressure, when *dependability* is a fervent wish as well as a word, men to whom Multiwalls are important are placing an increasing share of their orders with Union.

More so every day . . .

IT'S UNION FOR MULTIWALLS

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

Investigate the NEW SIMPSON

For Faster—Better—Lower Cost Mixing

SIMPSON Mix-Mullers do a *superior* job of material preparation . . . *superior* because these modern machines employ the true mulling principle of controlled mixing. That's why the two new higher capacity SIMPSON Mix-Mullers, the Model 2F and 3F, are so important in solving mixing problems where intimate mixing is vital to the ultimate production of quality products. This increasing need for *intimate* mixing has definitely indicated a trend toward adjustable and increased mulling pressures . . . here featured on the new 2F and 3F Mix-Muller. The results are even faster, better, lower cost mixing than you've ever had before.

The 2F and 3F SIMPSON Mix-Mullers use comparatively light mullers, and employ a unique spring-loaded muller arrangement which allows complete adjustment for all types of material. Because of the advanced design of the 2F and 3F SIMPSON Mix-Mullers, the material to be mixed is subjected to much more *Intensive Mulling* action. Each particle of material is coated with other components of the mix—not merely placed next to each other as is often the case in conventional type mixers. This intimate intensive mulling action prevents segregation after mixing . . . in handling . . . and in transit. Over 300 Simpson Mix-Mullers of this new design have already been thoroughly proved in service . . . your assurance of dependable, low cost operation.

Complete information about the Model 2F and Model 3F SIMPSON Mix-Mullers may be obtained from a National Engineer . . . or by writing for Bulletin 509.

ADVANTAGES

Here are the basic reasons why the new 2F and 3F Simpson Mix-Mullers are the "last word" in modern, scientific mixing.

1. Most thorough mulling action ever developed.
2. Greatest flexibility of operation ever offered.
3. Greater mulling speed—faster discharge.
4. Large batch capacity.
5. Greater uniformity—better batch control.
6. Much simpler, safer operation and maintenance.
7. Less horsepower required.
8. Incorporates all features of rugged construction and intensive mulling principle that have made Simpson Mix-Mullers the standard of the industry for over 30 years.
9. V-belt drive assures maximum flexibility and greater safety factor against sudden overloads.
10. Design backed by years of actual service.

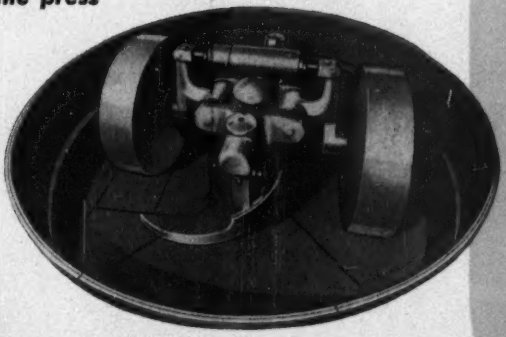
HIGHER CAPACITY 2F and 3F MIX-MULLERS

DO YOU REALLY KNOW WHAT MULLING IS?

WATCH the practiced technique of a chemist's mortar and pestle—the intensive smearing and rubbing actions—and basically *THAT'S MULLING.* Nothing compares with it in uniformly blending dry, semi-dry or pasty materials.

It is this process which develops the full potential qualities of the material through the "working and kneading" action. Obviously the best muller pressure-area ratio is that which will act upon the greatest number of grains per revolution of the muller. In the 2F and 3F Simpson Mix-Muller the ideal action is obtained by adjusting the muller pressure for the material being mixed. High unit pressure acting throughout a deep bed of material, the most effective condition, is obtained with the new muller design and the heavy compression spring.

WRITE FOR BULLETIN 509
. . . Just off the press



SIMPSON *MIX-MULLER* DIVISION
NATIONAL ENGINEERING CO., 604 Machinery Hall Bldg., Chicago 6, Ill.

Space-saving rugged

Built, shipped and installed as a compact unit, the new Elliott geared turbine has many advanced features that fit it to the most exacting requirements. Here are some of them:

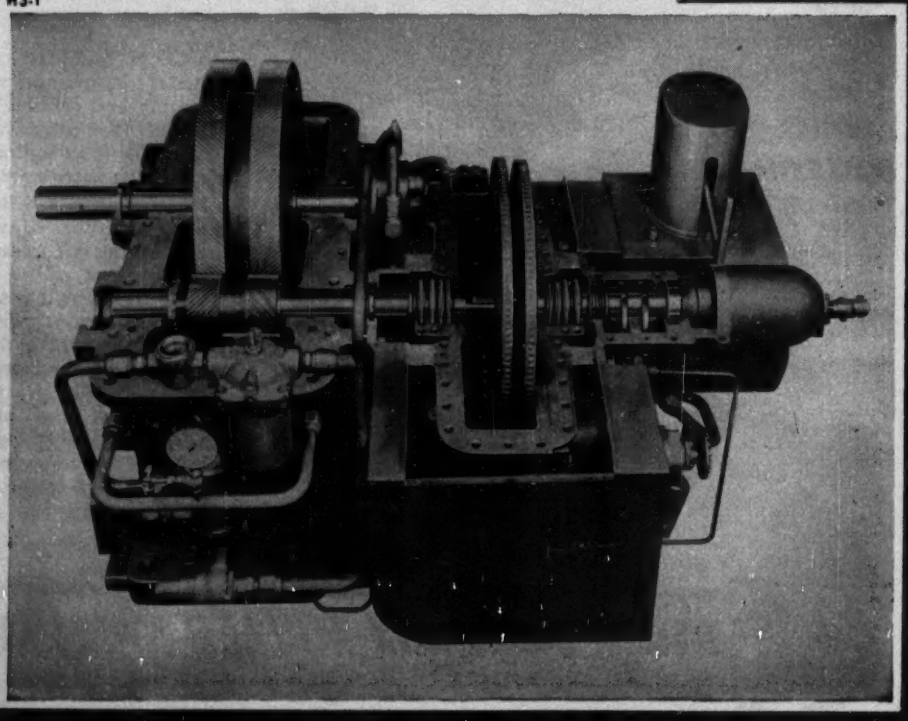
- **Turbine wheels and pinions mounted on a single sturdy high-speed shaft—**
- **Double-helical gears and pinions eliminate end thrust and the need for maintaining critical thrust bearing.**
- **Requires no base plate or external oil reservoir. Three-point support.**
- **Neatly arranged lubrication system, with all external oil piping connected to lower casing.**
- **Liner-type bearings . . . gear-type oil pump, self-priming . . . Kingsbury floating-ring type oil seals with slingers.**

Also built in coupled design, with pinion shaft flexibly coupled to the turbine.

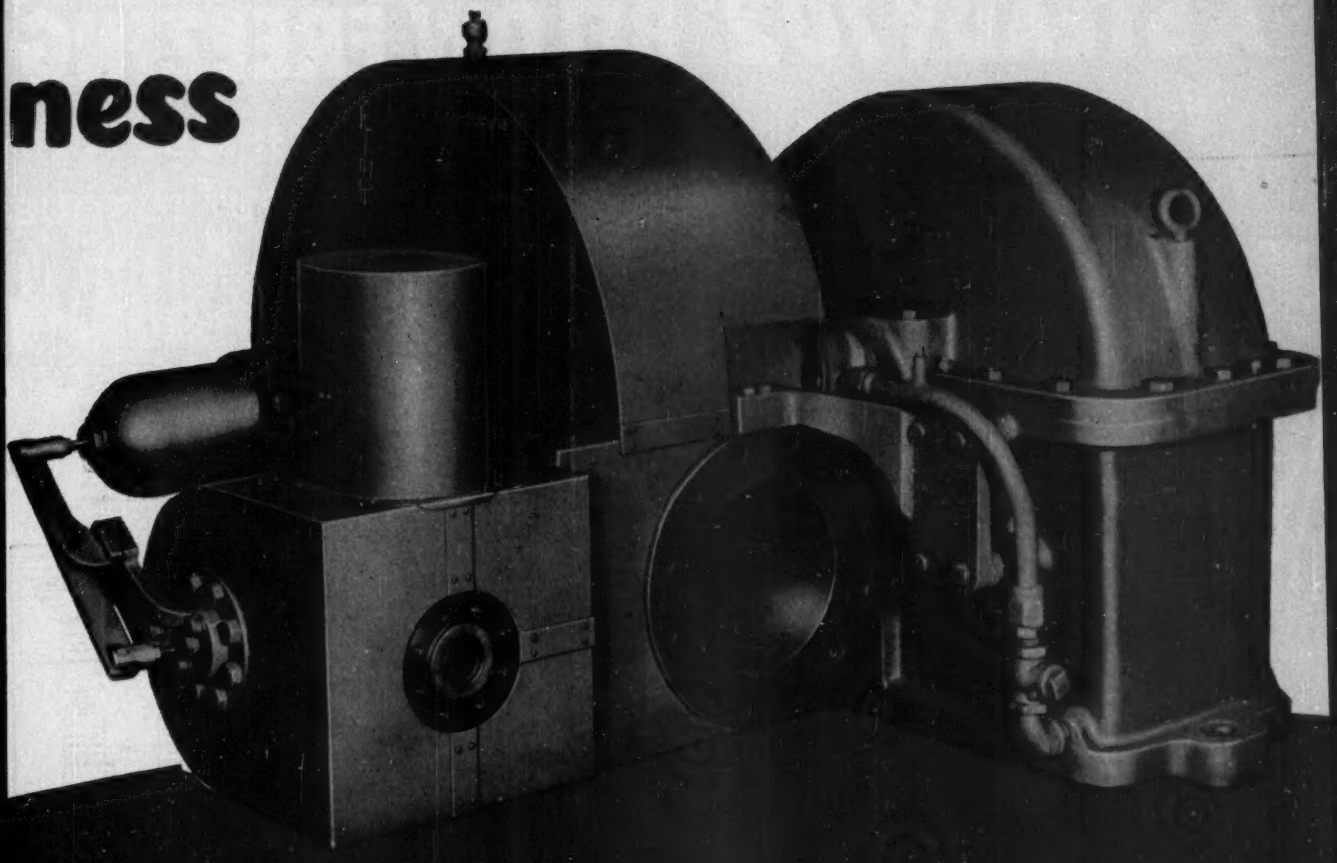
only one of many vital factors in the new

ELLIOTT Geared Turbine

H3-1

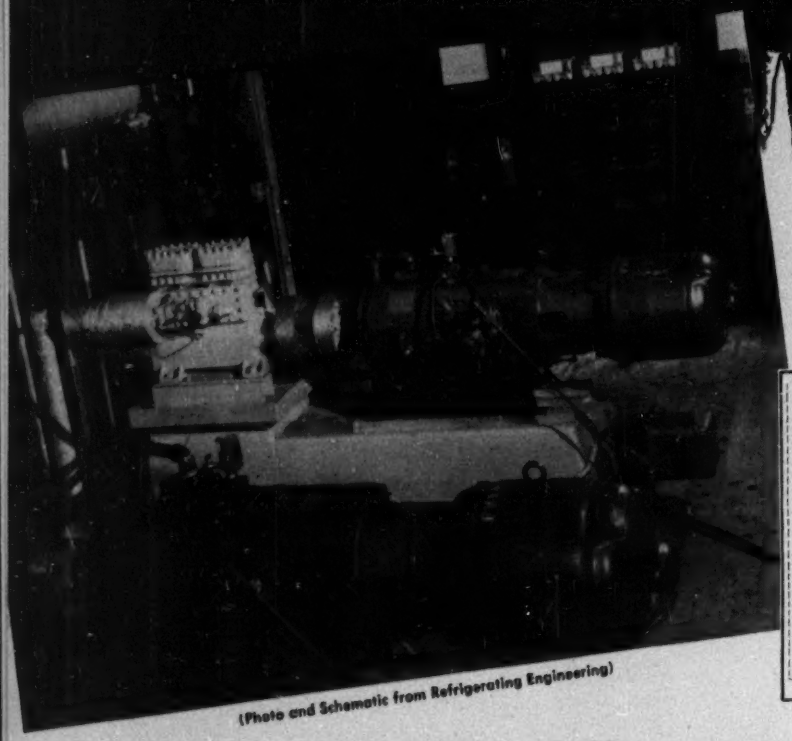


ness



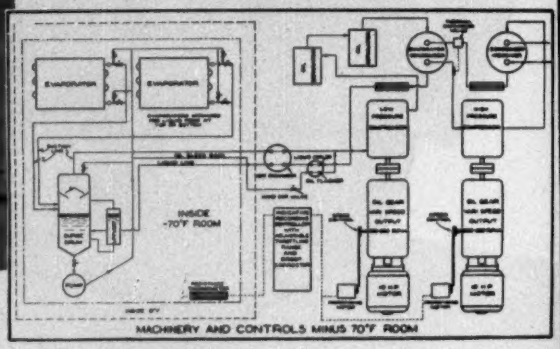
A STEADY 102° BELOW FREEZING

. . . CALLED FOR CONTINUOUSLY VARIABLE SPEEDS AND STABLE OUTPUT TORQUE



(Photo and Schematic from Refrigerating Engineering)

Two Oilgear Fluid Power Transmissions driving compressors for research laboratory's —70 degree testing room. (Other Oilgear Transmission drives compressor for 0 degree room.) Output speed of transmissions varies according to temperature differential upon resistance thermometers. Control of speed is entirely automatic. Manual control for starting is optional. Oilgear Fluid Power Drives and compressors operate continuously. (See schematic below).



OILGEAR *Fluid Power* SOLVED THIS PROBLEM

The wide range of installations that demonstrate the reliability, scope and ease of control of Oilgear Fluid Power Drives and Transmissions grows daily. A case history from REFRIGERATING ENGINEERING, official journal of the American Society of Refrigerating Engineers, telling how a research laboratory chose Oilgear Transmissions and obtained continuous, dependable performance without delay, is another chapter in that story.

Demands for tests of materials at extreme temperatures called for equipment able to hold testing room temperatures stable at all times—usually at 70° F. below zero. It also had to refrigerate test materials as rapidly as possible. This meant a system of varying compressor speeds automatically—so as to compensate for variations in heat load.

Previous experience had shown that . . . the use of direct current motors, or variable speed drives of the belt-and-pulley type, under automatic control, was not entirely reliable and required considerable servicing.

Then Oilgear Fluid Power Transmissions were adopted. These transmissions provide continuously and automatically variable output speed and maximum output torque at all operating speeds. Nearly two years' experience reveals that temperatures have been maintained within ±½° F. of the desired figure over long periods of time, that no attendant is required except for a few minutes' daily routine inspection, that the Oilgear drives are completely reliable.

Thus the evidence grows that if you are tired of machine or process drives and transmissions that don't stand up, if you want simpler, better, more productive and dependable drives, if you have problems not yet solved, it will pay you to contact Oilgear Fluid Power engineers. THE OILGEAR COMPANY, 1579 W. Bruce St., Milwaukee 4, Wis.

Oilgear Fluid Power

Are Your Profits Going Up In Smoke?

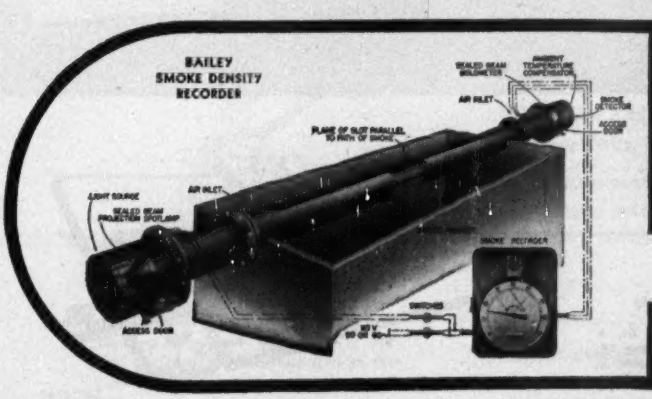
Let Bailey Controls Help Cut Down Your Production Losses

Process materials or fuels that go up the stack as dust or products of incomplete combustion are the same as money thrown to the four winds. But unlike money, this air pollution is not welcome in your community.

Your local Bailey Engineer can help you reduce this waste—and improve your relations with smoke prevention officials. The solution he offers will be based on many years of Company experience in the burning of commercial and waste fuels. He has information which will help you to arrive at the best control set-up for fuels, fired singly or in combination in a wide variety of furnaces, heaters, kilns, ovens and dryers.

His selection of meters and controls for your needs is based on a *complete* line of equipment. He can offer you Fuel—Air Ratio Meters or Gas Analyzers; Pneumatic or Electric Telemetering; Orifices, Flow Nozzles, Venturis or Weirs; full size or miniature instruments —and an infinite selection of automatic control systems from which to choose the one best suited to the operation of your process.

Bailey Engineers are located in almost every large industrial center. A call to our nearest office is a good first step in the solution of your fuel economy and smoke prevention problems. P-25



BAILEY METER COMPANY

1054 IVANHOE ROAD
CLEVELAND 10, OHIO

Process Controls
TEMPERATURE · FLOW
PRESSURE · LEVEL
GAS ANALYSIS · RATIO

take a **CLOSER LOOK** at this

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION

General Offices & Plants
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. • Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19, Texas • Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 3, Okla.

B&W SEAMLESS and WELDED TUBES

IA-16965

WEALTH OF TUBING DATA

TB TECHNICAL BULLETIN

TDC TECHNICAL DATA CARD

TR TECHNICAL REPORT

Tube engineering data . . . prepared by engineers for engineers . . . pours out of Babcock & Wilcox headquarters in an endless stream of technical literature and other communications, to keep designers, equipment manufacturers and process engineers well-informed about latest tubing developments and applications, and to provide an interchange of field experience among tube users.

Important findings of metallurgists and application engineers, of chemists and of all the other specialists concerned with pressure and temperature requirements and special tubing needs are condensed and published in ready-reference form as fast as data can be reviewed and verified.

B&W offers a most comprehensive file of information available on carbon, alloy and stainless tubing, both seamless and welded —the technical help this literature offers is exceeded only by the personal assistance on specific tubing problems you may expect from B&W field representatives.

If you want facts where you can find them —tips to help you speedily solve tubing problems and to suggest ideas for greater tubing service satisfaction—send for B&W bulletins you may select from this partial list of current data.

YOURS FOR THE ASKING

☐ TB-19	B&W Stainless Croloy Tubing Steels, Seamless and Welded, Condensed Technical Data
☐ TB-1	Properties and Methods of Working Seamless and Welded Tubes and Pipe of the B&W Stainless Croloys
☐ TB-332	B&W Stainless Pipe, Seamless or Welded
☐ TDC-130	B&W Stainless Pipe and Tubing Croloy 18-8S (Type 304), for Pressure and Mechanical Uses
☐ TDC-132	B&W Stainless Pipe and Tubing, Croloy 18-8 Cb (Type 347), for Pressure and Mechanical Uses
☐ TDC-133	B&W Stainless Pipe and Tubing, Croloy 16-13-3 (Type 316), for Pressure and Mechanical Uses
☐ TDC-134	B&W Stainless Pipe and Tubing, Croloy 25-20 (Type 310), for Pressure and Mechanical Uses
☐ TDC-140	B&W Stainless Pipe and Tubing, Croloy 12 Al (Type 405) 18 (Type 430), 27 (Type 446), for Pressure and Mechanical Uses
☐ TDC-143	B&W Stainless Tubing, Croloy 12 (Type 410), 12-2 (Type 414), Properties and Applications
☐ TDC-148	B&W Croloy Stainless Steels, Condensed Data on Working Seamless or Welded Tubing and Pipe
☐ TA-1517	B&W Stainless Steel Tubing for the Food Processing Industry
☐ TB-6	Properties of Carbon and Alloy Seamless Steel Tubing for High-Temperature and High-Pressure Service
☐ TB-12	B&W Alloy Tubes and Pipe, Condensed Technical Data on High-Temperature Steels
☐ TB-328	How to Keep Down Maintenance Costs in Pulp and Paper Mills
☐ TB-329	B&W Heat Exchanger and Condenser Tubes, Seamless and Welded, Stainless, Alloy and Carbon Steels
☐ TB-344	Applications of B&W Tubular Products — Stainless, Alloy and Carbon Steel, Seamless and Welded
☐ TDC-136	Chemical Compositions, B&W Seamless Alloy Steel Tubing, B&W Croloy Steels of the Low and Intermediate Alloy Groups.
☐ TDC-138	B&W Pipe, Seamless and Welded, Carbon, Alloy and Stainless Steels, Dimensions, Weights, Specifications, Grades, Analyses
☐ TA-1559	B&W Steel Tubing — Seamless or Welded Stainless, Alloy and Carbon Steels—for the Process Industries
☐ TB-11	Specifications for Seamless and Welded Tubular Products—Stainless, Alloy and Carbon Steels
☐ TB-15	Weight Tables, Round, Seamless and Welded Steel Tubing
☐ TB-335	Descriptive Terms—Steel Tubing
☐ TDC-125	Hardness Conversion Tables
☐ TR-514	How You Can Avoid Boiler Tube Corrosion
☐ TR-515	The Creep and Stress-Rupture Testing of Steam-Boiler Materials
☐ TR-516	Some Experiences in Service, Power, Oil and Chemical Plants

CLIP AND RETURN ENTIRE PAGE

Mr. Tubes — your nearby B&W Tube Representative—will be happy to provide additional information and to discuss any specific tubing problem with you.

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

Beaver Falls, Pennsylvania

☐ Please send me the B&W bulletins checked.

☐ Please add my name to your mailing list to receive new bulletins when available.

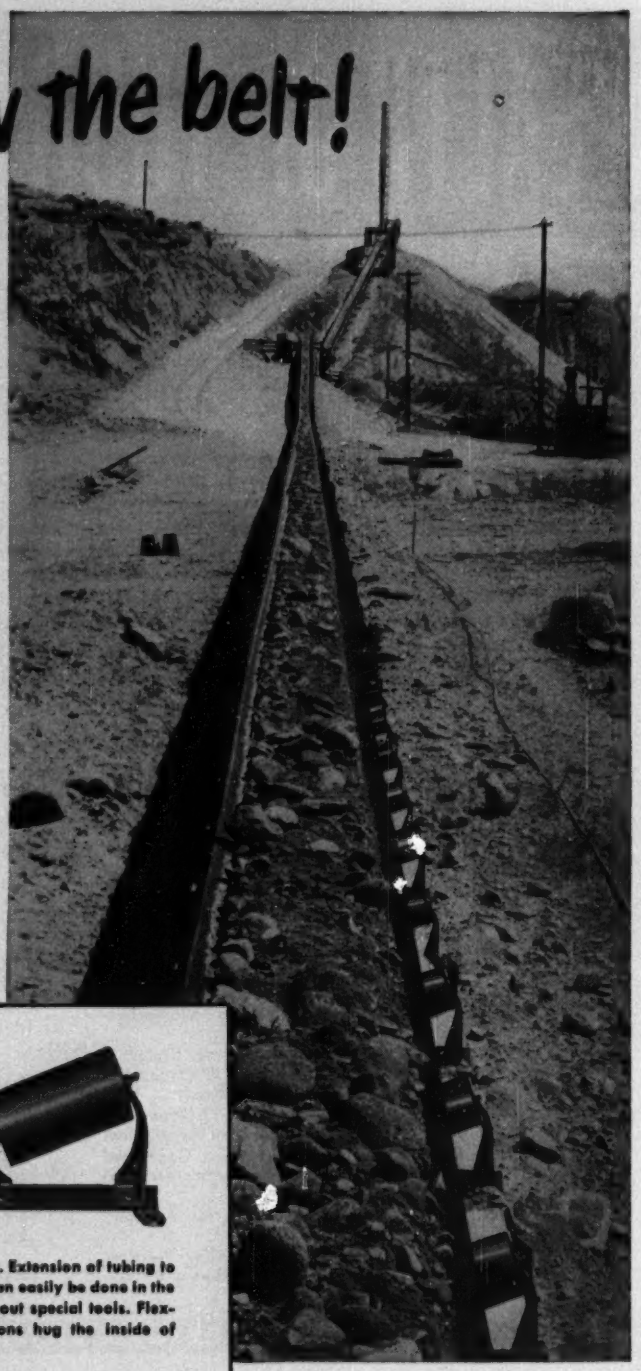
NAME_____ POSITION_____

COMPANY_____

STREET ADDRESS_____

CITY_____ ZONE_____ STATE_____

a big "hit" below the belt!

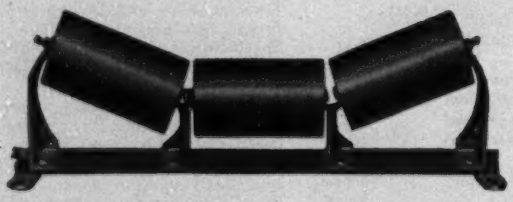


Nearly everyone realizes the advantages of belt conveyors for low-cost transportation of bulk materials. But what goes on below the belt is, perhaps, too often taken for granted. Certainly, the belt idler, more than any other piece of equipment, is responsible for the low cost of belt conveying per ton of material handled.

That's why Rex® Idlers are so often specified. Rex has been the leader in idler design and construction for over 25 years and sets the standard that others are working toward.

An idler must "keep rolling." If it freezes up, the belt will quickly wear through the roll, leaving sharp edges to cut your belt. The most common causes of idler "freeze-ups" are grit and dirt entering the bearings and build-up of material underneath the roll. To keep your Rex Idlers rolling, all you have to do is *keep your deck plates clean.* This will prevent material from building up on the rolls. The Rex Triple Labyrinth Grease Seal does the rest. The grease is there only to keep out dirt and grit, not to lubricate. With the special Rex seal design, the grease stays in . . . the dust stays out.

Remember, your idlers are the backbone of your entire belt conveyor. Don't gamble. Insist on Rex and be sure of a trouble-free performance year after year. For all the facts call your nearest Chain Belt Field Sales Engineer or write for Bulletin 51-81. Chain Belt Company, 4648 W. Greenfield Avenue, Milwaukee 1, Wisconsin.



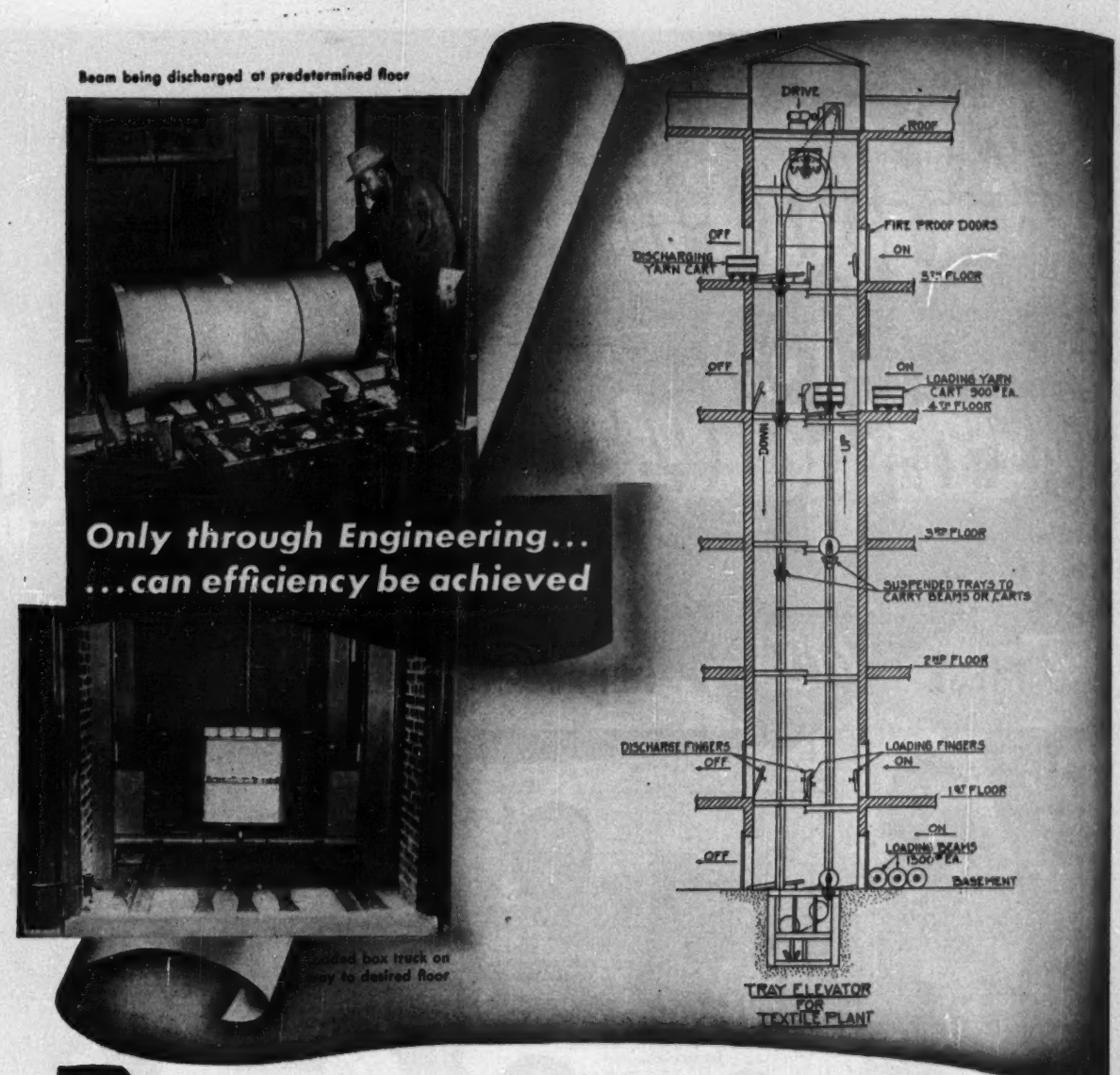
For over 25 years Rex idlers have been recognized as leaders in the field of idler design. Now Rex again leads the way with the flexible grease line. Note the accessible, protected location of the fitting. Extension of tubing to far side can easily be done in the field without special tools. Flexible sections hug the inside of the base.

CHAIN BELT REX COMPANY

Chain Belt COMPANY OF MILWAUKEE

Atlanta • Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati Cleveland • Dallas • Denver • Detroit • El Paso • Houston • Indianapolis Jacksonville • Kansas City • Los Angeles • Louisville • Midland, Texas • Milwaukee Minneapolis • New York • Philadelphia • Pittsburgh • Portland, Oregon • Springfield, Mass. • St. Louis • Salt Lake City • San Francisco • Seattle • Tulsa • Worcester

Distributors located in principal cities in the United States and abroad



Firestone saves $25,000 a year with this G-W "Ferris Wheel"

Moving 1300-lb. beams of rayon and 900-lb. box trucks in and out of freight elevators is a back-breaking job. Yet approximately 230 of these bulky loads must be lifted (and empties returned) every day at the Firestone Textiles Division of the Firestone Tire and Rubber Co., Gastonia, N. C.

This Gifford-Wood "Ferris Wheel"—a 6-story roundabout tray elevator—has assumed most of the work load. Beams and trucks are automatically picked up on the loading side of a shaftway by trays suspended between two endless chains, carried to the top, eased over the drive sprockets, lowered to the desired floor, and automatically discharged.

The $25,000 annual saving is basically one of reduced labor requirements and improved handling efficiency, and the limited manual work remaining is much less strenuous than formerly.

This is just one of many conveyors born of G-W ingenuity and experience—a product of efficiency through engineering. Call on G-W Materials-Handling Engineers to survey your present methods; you are under no obligation. It might well prove to be a step toward higher profits through lower operating and maintenance costs.

When You Think of Materials Handling—Think of **GIFFORD-WOOD CO.**

Since 1814 • Hudson, New York

NEW YORK 17, N. Y. 420 LEXINGTON AVE. | ST. LOUIS 1, MO. RAILWAY EXCHANGE BLDG. | CHICAGO 6, ILL. 565 W. WASHINGTON ST.

B4405

You can put full confidence in them!

THESE McQuay REPRESENTATIVES

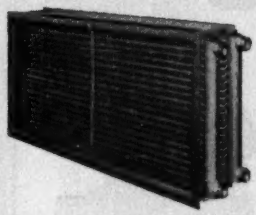
No. 1 in a series of 3 advertisements

McQuay INC.

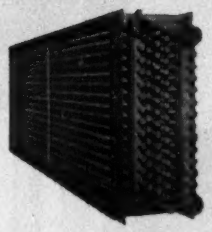
HEATING
REFRIGERATION
AIR CONDITIONING

1622 Broadway St. N. E., Minneapolis 13, Minnesota

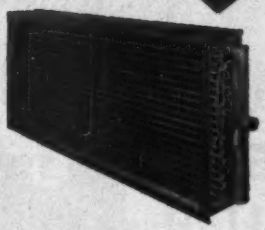
THIS COMPLETE LINE OF FAMOUS McQuay PRODUCTS



WATER COIL

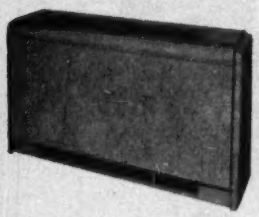


CLEANABLE TUBE WATER COIL

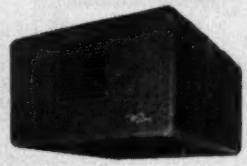


DIRECT EXPANSION COIL

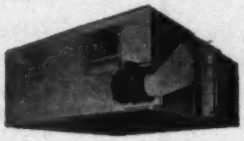
"BLAST" HEATING STEAM COIL



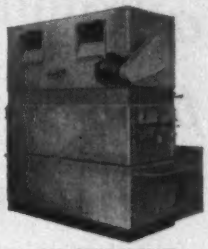
SEASONMAKER (FLOOR)



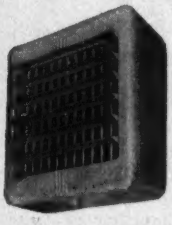
"RH" AIR CONDITIONER



AIR CONDITIONER
(Suspended Model)



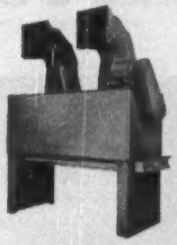
AIR CONDITIONER
(Floor Model)



HORIZONTAL UNIT HEATER

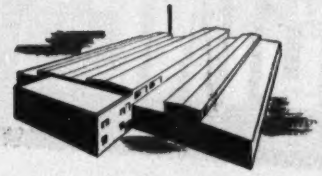
DOWN FLOW UNIT HEATER

BLOWER TYPE UNIT HEATER
(Suspended Model)

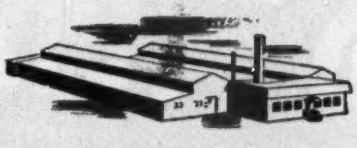


BLOWER TYPE UNIT HEATER
(Floor Model)

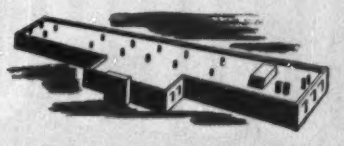
McQuay representatives, in all principal cities throughout the United States, are qualified by long experience and training to help you satisfy all of your air conditioning and heating requirements. For cooperation in making the sale, technical advice, or getting the job done on time, consult the McQuay representative in your territory. Available to you through him is the complete line of McQuay products, featuring famous Ripple-Fin construction—a McQuay exclusive, assuring maximum heat transfer efficiency and dependable performance.



PLANT 1—1600 Broadway N. E.
MINNEAPOLIS 13, MINN.

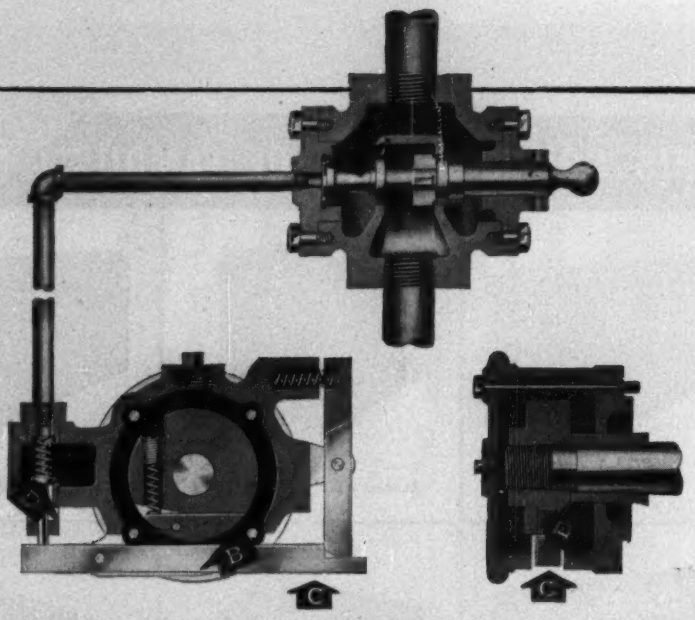


PLANT 2—1729 Broadway N. E.
MINNEAPOLIS 13, MINN.

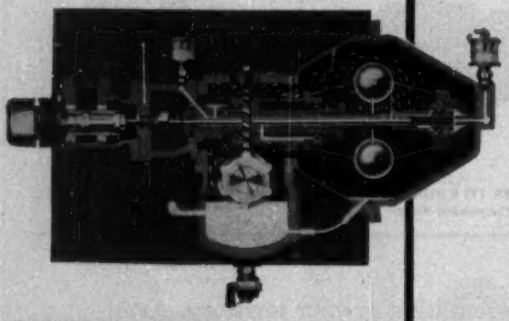


PLANT 3—4th and Park Ave.
FARIBAULT, MINN.

Only Coppus Turbines offer you *a pilot operated* excess speed safety trip



The constant speed governor on Coppus Turbines, plus this Excess Speed Safety Trip, gives you extra protection for your turbine investments. Here's how it works. When steam is turned on, pressure opens valve A fully. When excess speed is reached, centrifugal force throws weight B against lever C lifting pilot valve D. This releases pressure in back of valve A, closing this valve instantaneously, to shut off the steam. Safety trip can be tested easily while turbine is running by manually tripping and resetting lever C.



Sectional view showing lubricating system of fully enclosed Coppus Constant Speed Governor. Governor head acts directly on stem of steam admission valve. No external levers required. Ball bearing construction eliminates end play and gives frictionless operation.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

CUT YOUR COSTS PER HORSEPOWER

When you choose from the Coppus Steam Turbine line, you get the right size for your requirements . . . and make substantial savings on *any* size from the 150 hp turbine down to the smallest. Low in first cost, Coppus Turbines save you more money in the long run. Operating and maintenance costs are kept low by such other features as: large number of steam nozzles, controlled individually by manually operated valves; hard chromium plating on shaft at the stuffing box; replaceable cartridge type bearing housings; optional carbon ring packing assembly for back pressures up to 75 pounds.

WRITE FOR BULLETIN 135

COPPUS ENGINEERING CORPORATION, 222 Park Ave., Worcester 2, Mass. Sales offices in THOMAS' REGISTER.

COPPUS "BLUE RIBBON" TURBINES

LADISH

Controlled Quality

PIPE FITTINGS

offer dependability safeguarded by advanced metallurgy

Year after year . . . in all kinds of service . . . Ladish Controlled Quality Fittings set new standards of reliability. One reason is the strong reliance on technical progress. Every new facility and advanced technique of modern metallurgy is fully utilized to develop desirable physical properties to maximum limits . . . while unrelenting test procedures continuously safeguard metallurgical soundness and provide users with authentic data proving the complete dependability of every Ladish Fitting.

TO MARK PROGRESS

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF . . . ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.

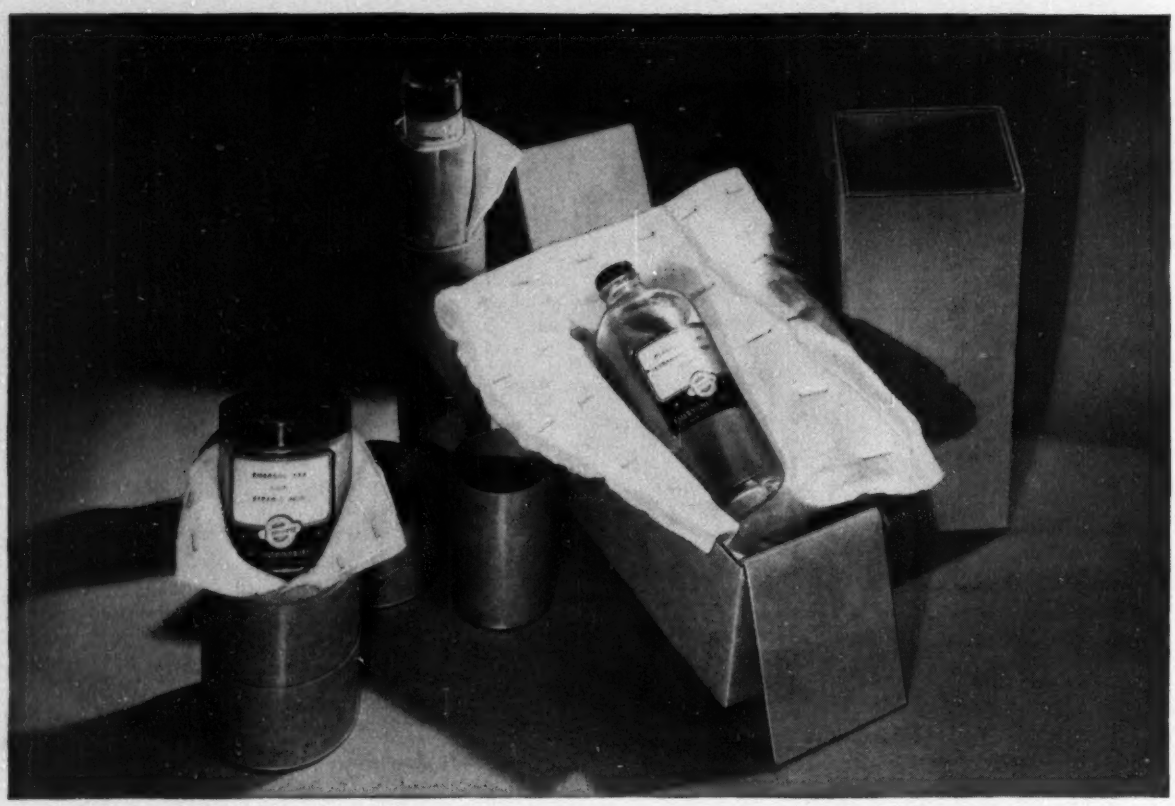


Photo courtesy of Emery Industries, Inc., showing their standard method of mailing chemical samples.

Are your chemical products packaged as efficiently as these?

Whenever your product arrives at its destination damaged in any way, you suffer a loss not only of money, but of time and good will, too. Yet it's easy to *prevent* damage in transit and speed up packaging operations through the use of up-to-date packaging materials. Many chemical companies have discovered this about Kimberly-Clark Interior Packaging—KIMPAK*—a modern packaging material of unlimited versatility that provides *custom protection* for every type of chemical product.

KIMPAK is soft and clean, conformable—easy to apply as wrapping paper. It protects the most delicate products against shock, vibration, and rough handling in transit. Light in weight, KIMPAK gives more protection than most materials of far greater weight and density. And KIMPAK absorbs up to 16 times its own weight in moisture within 30 seconds to comply with Parcel Post regulations.

Regardless of whether you package powders, capsules, tablets, granules—liquids in bottles, jars, tubes, vials or ampoules—you'll discover that KIMPAK gives maximum protection at lowest true cost. Available in rolls or sheets of various dimensions and thicknesses—backed or unbacked—to suit your special packaging need. For complete information, write to Dept. O-23, Kimberly-Clark Corporation, Neenah, Wisconsin.

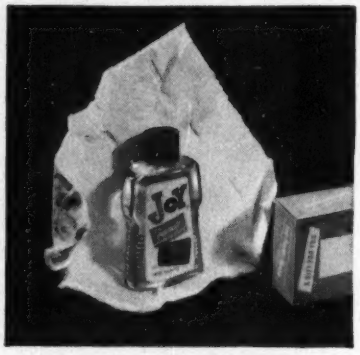


Photo courtesy of Procter & Gamble—Joy, a dishwashing detergent.

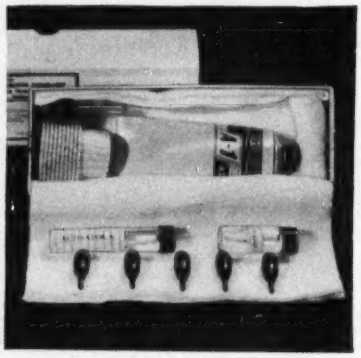


Photo courtesy of Armstrong Products Co.—Adhesives.

KIMPAK INTERIOR PACKAGING

A Product of Kimberly-Clark

*T. M. REG. U. S. & FOREIGN COUNTRIES

PROSPERITY IN THE USA: How Wealthy Are We?

Again, how prosperous *are* the people of the United States?

This is the third of a series of messages devoted to this crucially important and much-debated question. The first two messages dealt with what has been happening to our national income, both in terms of its growth and how it is divided among individuals.

This third message deals with what has been happening to the resources—factories, farms, mines, and equipment of all kinds—out of which income is created. It deals with what economists call our wealth.

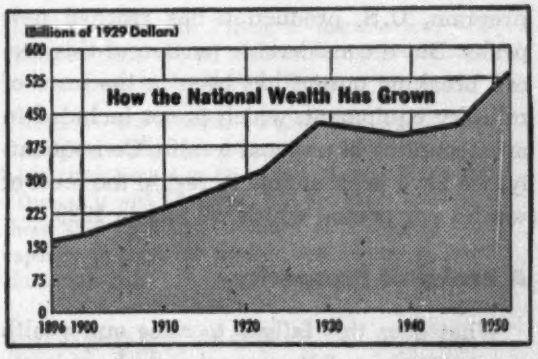
It is possible for a nation to enjoy apparent prosperity for a time by rapidly exhausting its resources. But to sustain prosperity over the long pull a nation must see that its wealth is not dissipated. Hence what is happening to our wealth now is a harbinger of what is going to happen to our prosperity later on.

How Wealth Is Measured

It is often asserted that the most vital element in a nation's wealth is its people. There is a lot in this idea. For example, the full value of a country's hospital and surgical equipment depends on its physicians and their skill in handling the equipment.

However, no one has ever devised a satisfactory way to put a value on human beings. So people are omitted from calculations of national wealth. So, too, is military equipment. It is regarded as basically destructive and hence not a real addition to wealth. Otherwise, the wealth of a nation is calculated in terms of the dollar value of its physical resources.

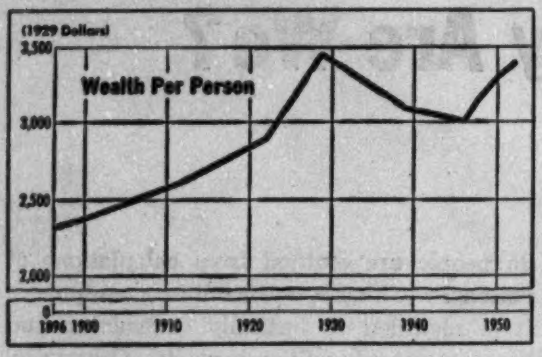
The following chart shows the wealth of the U.S.A. at various intervals during the past 50 years. For the period through 1948 the figures come from a pioneering study by Raymond Goldsmith of the National Bureau of Economic Research, which is widely regarded as the foremost organization in its field. The figures since 1948 are estimated. To remove the effect of price changes, all of the wealth figures are calculated in 1929 prices.



From this chart one fact stands out clearly. It is that since 1929 our national wealth has not been increasing as steadily as it did during

earlier periods. Indeed, in 1946 our total national wealth was actually less than it was in 1929. Only in the last six years have we been able to make any consistent additions.

Even these gains are less impressive when the growth in our population is taken into account, as illustrated by the following chart.



This chart makes it clear that when the nation's wealth is divided by the population, we are slightly worse off per person today than we were in 1929. This is the case in spite of the large additions to our national wealth since 1946.

Depression and war are the two principal reasons we have made no progress in increasing our wealth per person since the 1920s. The depression brought mass unemployment and greatly reduced production which ruled out any increase in wealth. During World War II and again during the post-Korean mobilization program, U.S. production has reached new peaks. But a considerable portion of this record breaking output has been in the form of military equipment, which is not included in an accounting of national wealth. Consequently, we have been unable to regain the level of wealth per person which we had in 1929.

A Brake of Prosperity

What does this failure to raise our wealth per person mean? It means that we have fewer resources with which to create income for each individual. It means that we have made no progress in the crucial task of assuring future increases in prosperity.

As the second editorial in this series demonstrated, we have gone so far in equalizing individual incomes that "the possibilities of increasing the income of the rest of the people by 'soaking the rich' have largely disappeared." From now on the only promising way to increase our individual incomes is to increase our national earning power.

During the past four years it has taken about $3.60 of national wealth to yield $1 of income after taxes. This is a low figure for the wealth needed. Prior to World War II there were long periods when it took at least $5 of national wealth to produce $1 of national income. The experts in this field are by no means certain that it will not again take $5 rather than $3.60 of wealth to increase income by $1.

But let us assume that $3.60 of wealth will suffice to provide $1 of income in the years ahead. If by 1960—seven years from now—the income of the average American is to be increased from about $1490, where it stands at present, to $2000, we must add $310 billion to the national wealth. This is nearly three times as much as we have added to our wealth since the end of World War II, seven years ago.

Because we have made large additions to our productive equipment in recent years, fears are frequently expressed that we shall soon be plagued by an excess of such equipment. But the facts about our national wealth do not support this conclusion. They indicate that we still have ahead of us a tremendous job of increasing our resources if the American standard of living is again to resume the steady climb which was interrupted by depression and war.

McGraw-Hill Publishing Company, Inc.

People *will talk*

開密克幫我們發展工業。
"Chemico helped us develop our industry"

"Chemico" heeft ons meer gegeven dan wij verwachtten.
"Chemico gave us more than we expected"

"كيميكو" رتبه
"It's designed by Chemico"

"केमिको" ने सारा काम किया।
"Chemico did the whole job"

"Chemico" comprend nos problèmes.
"Chemico understands our problems"

"CHEMICO" SABE SE É PRÁTICO.
"Chemico knows whether it's practical"

ケミコに尋ねよう!
"Let's ask Chemico about this"

La reputación de "Chemico" nos ha persuadido.
"Chemico's reputation sold us"

When our representatives travel to the far corners of the earth, they find that word of Chemico's activities has gone before them.

Yes, people *will* talk . . . and carry the news of Chemico accomplishments in the design and construction of plants for the production of heavy chemicals: fertilizers for India, Mexico, the Philippine Islands and Egypt; sulfuric acid for Canada, England, Formosa and Brazil; urea for Japan; sulfur recovery for Colombia; pickle liquor recovery for the Union of South Africa, to name a few. And naturally these are in addition to numerous large-scale projects in the United States.

Chemico has created, designed and erected more than 800 installations during the past 37 years that have given people much to talk about. That's why "Discuss it with Chemico" has become a byword of those who need new facilities or additional plant capacity to meet the world's ever-expanding heavy chemical needs.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

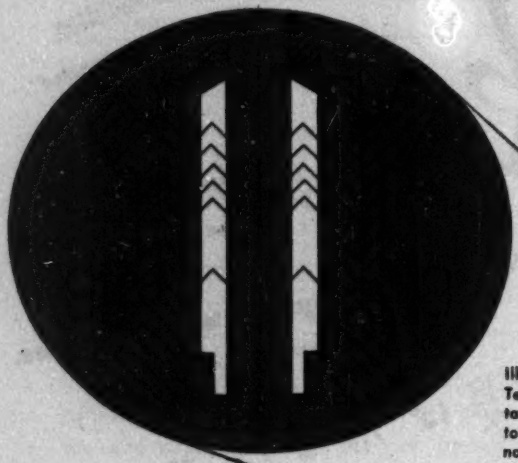
TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICA CYANAMID (PTY) LTD., JOHANNESBURG

CHEMICO

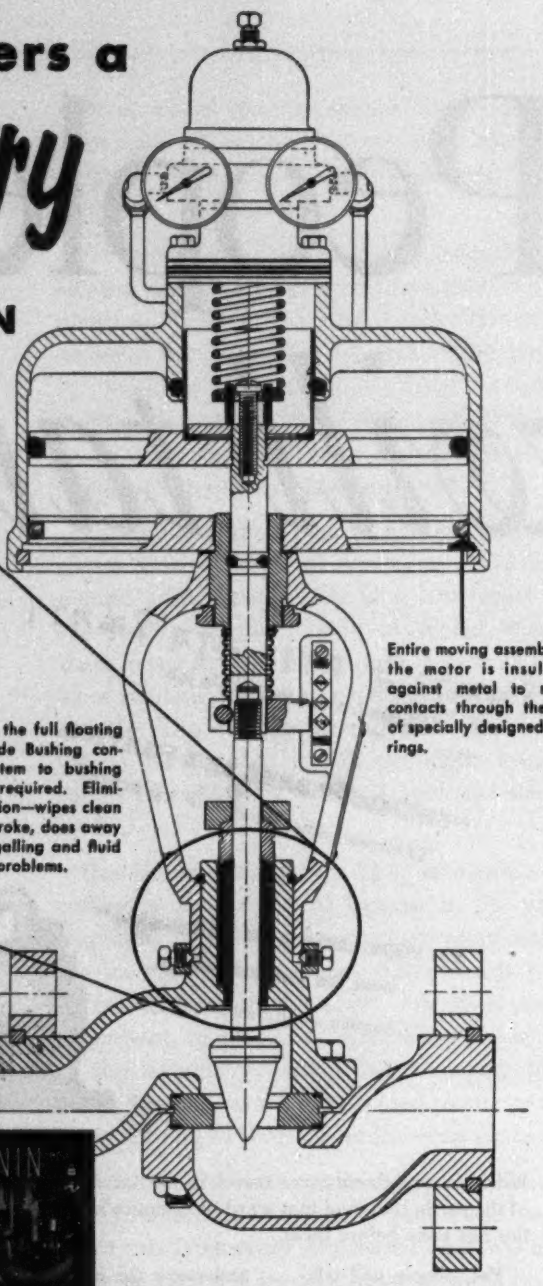
Chemico plants are profitable investments

CC-825

Now ANNIN offers a *Revolutionary* PRINCIPLE IN VALVE CONSTRUCTION



Illustrating the full floating Teflon Guide Bushing contact. No stem to bushing tolerance required. Eliminate corrosion—wipes clean on every stroke, does away with both galling and fluid hardening problems.



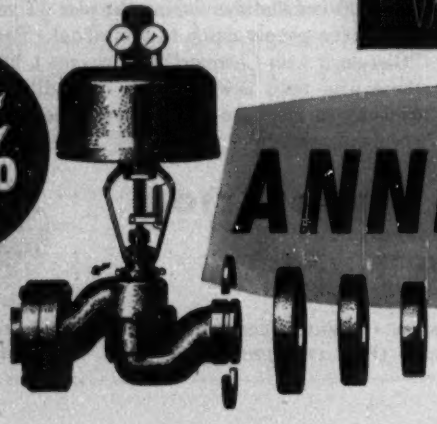
Entire moving assembly of the motor is insulated against metal to metal contacts through the use of specially designed "O" rings.

By incorporating a Teflon Guide Bushing,—Annin design provides mechanical perfection in control valve operation. How? Because now Annin valve offers full floating operation free from any metal to metal contact in moving parts. The valve stem floats in contact with Teflon,—the Domotor portion of the valve floats on Hycar "O" rings. Teflon eliminates valve stem galling, and all difficulties which develop when soft, corrosion resisting alloys are in contact as bearings.

Teflon is self-lubricating and requires no external lubrication. It won't stick so the customary tolerance between guide bushing and valve stem is eliminated. With the new type guide bushing used by Annin, an interference fit is provided and solidly retains the valve stem and plug assembly. The stem is wiped clean on every stroke preventing scale or dirt from scoring or any tendency toward fluid hardening problems. Valves now in service may be changed over to the new guide material.

Write for your copy now

CUT INVENTORY 50% WITH



ANNIN *Control* VALVES

THE ANNIN COMPANY 3500 Union Pacific Avenue
Los Angeles 23, California

I*P*E NOW BRINGS YOU*..

the distillation column that is making headlines..

The Enterprise Tribune
NEW TURBOGRID TRAYS HAVE OUTSTANDING ADVANTAGES
• Up to 100% greater capacity than well-designed bubble cap trays
• As much as 80% less pressure drop per tray
• Savings up to 50% in installed cost of new column shells
• High efficiency
• Longer tray life
• Easier installation and maintenance
• Easier control and operation

*Under license granted by the Shell Development Company, **Industrial Process Engineers** now makes available to you both design and construction of these revolutionary, new trays . . . either separately or as part of complete vapor-liquid contacting units.

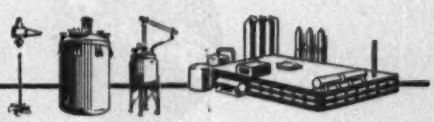
Suitable for existing bubble tray columns that are overloaded or require replacement, or for new installations, these grid trays cost only about *one-half* as much as bubble cap trays. What's more, they permit design at *minimum cost* and *optimum performance* for any service.

And you get tray designs of proven and assured performance . . . backed by 20 years of research experience by Shell laboratories throughout the world.

Compare for yourself! **You can get further information or an estimate on your requirements (without obligation) by writing or 'phoning I*P*E. Do it today!**

*Write now for your free monthly copy of I*P*E's engineering bulletins on "Practical Equipment Design and Construction."*

INDUSTRIAL PROCESS ENGINEERS



2 Lister Avenue, Newark 5, New Jersey

ENGINEERS, DESIGNERS AND MANUFACTURERS OF PROCESS PLANTS AND EQUIPMENT

In some things ***Quality*** *is obvious*

In Coal-Tar Chemicals ***Quality*** *must be proved by performance*

BUY BARRETT AND BE SURE!

When you buy from Barrett, you get *uniform* quality resulting from Barrett's basic position in raw materials *and* nearly 100 years of experience in the manufacture of coal-tar products.

Barrett* coal-tar chemicals

Phenols
Cresols
Cresylic Acids
Xylenols
Pickling Inhibitors
Benzol
Toluol
Naphthalene
Hi-Flash Solvent
Phthalic Anhydride
Dibutyl Phthalate
ELASTEX* DCHP Plasticizer
"ELASTEX" 10-P Plasticizer (DIOP)
"ELASTEX" 50-B* Plasticizer
"ELASTEX" 28-P Plasticizer (DOP)
Phenolic Resins
Niacin (Nicotinic Acid)
Isonicotinic Acid
Pyridines
Picolines
Quinoline
Lutidines
Tar Acid Oils
Neutral Coal-tar Oils
Coal-tar Creosote
CUMAR* Paracoumarone-Indene Resin
Carbonex* Rubber Compounding Hydrocarbon
Bardol* Rubber Compounding Oil
Flotation Agents

Barrett

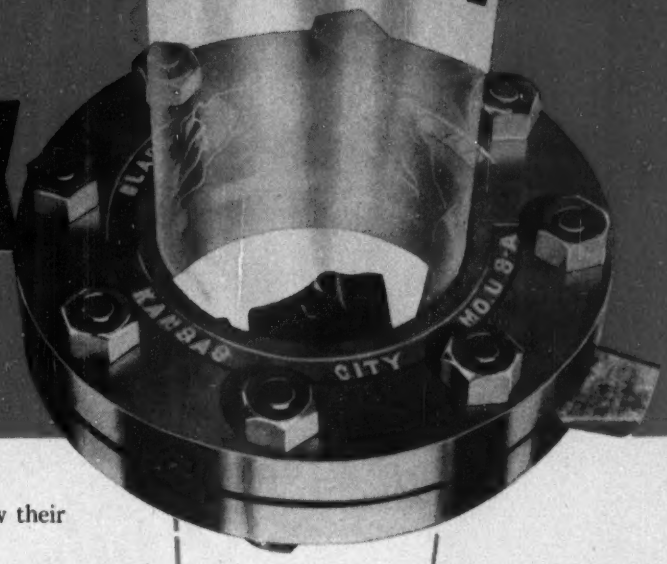
BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

In Canada:
The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

*Reg. U. S. Pat. Off.

The safe way for the process industry to blow its top

SAFETY BS&B HEADS OUR 60TH YEAR



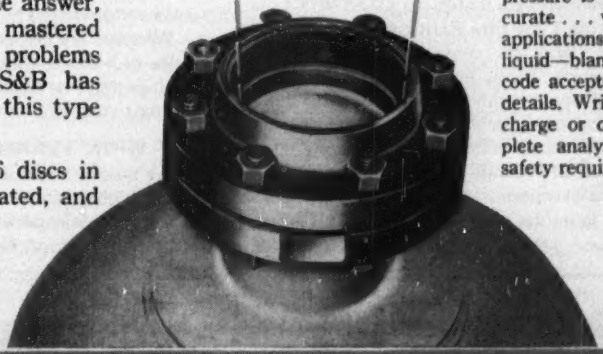
People under pressure sometimes blow their top.

It's much the same with fluid lines . . . only here it can be done with engineered planning and safety. Safety-minded, money-wise process industries guard against injury, damage and loss, from overpressure by installing BS&B Safety Heads on their pressure vessels. BS&B Safety Heads permit a fluid line or vessel to blow its top—SAFELY! What actually blows is the rupture disc—the heart of the Safety Head. BS&B designs the disc to rupture at the pre-determined pressure which you specify . . . builds in a controlled weakness. Disc is guaranteed to rupture within plus or minus 5% of specified pressure. The men you can ask about safety for your pressure vessels are the Safety Head specialists of BS&B. They have the answer, for these men have studied and mastered the behavior characteristics and problems of these thin ductile metals. BS&B has assembled the largest selection of this type of metal in the world.

Before delivery, 1 out of every 6 discs in every lot is selected at random, rated, and checked by actual rupture tests.

The safest way to keep over-pressure within pressure systems under control

Use BS&B Safety Heads for primary relief wherever maximum protection is required . . . or for secondary relief to back up a relief valve whenever the contents of the vessel or system may prevent the valve from functioning properly. BS&B Safety Heads provide full pipe-sized unrestricted opening. Rupture discs are available within a range of 5 lbs. to 40,000 lbs. Rupture from overpressure is fast, positive and accurate . . . whether your pressure applications are for air, gas or liquid—bland or corrosive. They're code accepted. Get the complete details. Write today. There's no charge or obligation for a complete analysis of your pressure safety requirements.

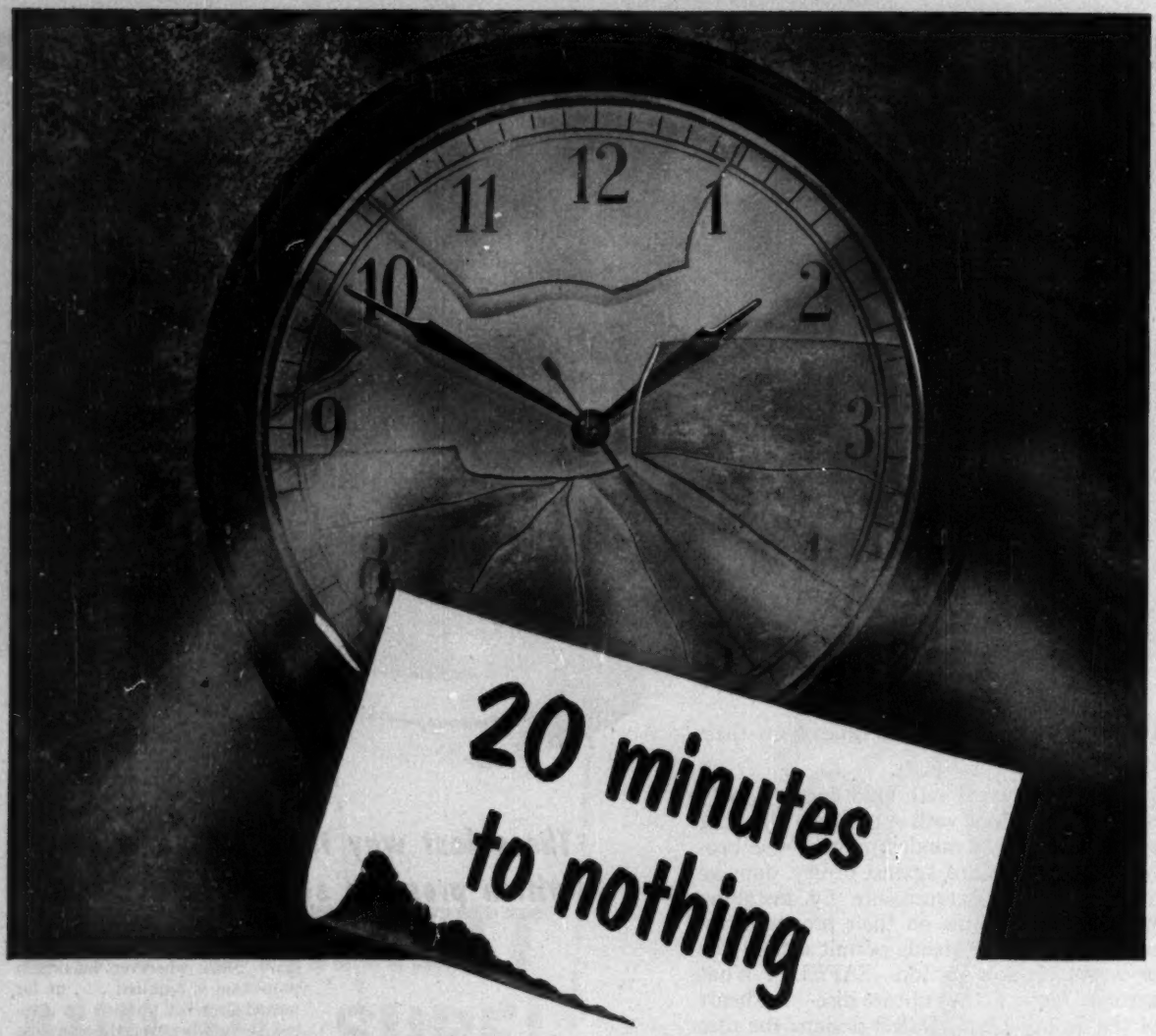


BLACK, SIVALLS & BRYSON, INC.

Safety Head Division, Dept. 2 N2

7500 East 12th Street — Kansas City 26, Missouri

SAFETY BS&B HEADS OUR 60TH YEAR



You could know the plant... 20 years of steady growth ... 20 years of work, brains and money... then in 20 minutes a little fire got away and reduced it all to nothing.

But, your larger size fire hazards can be protected very efficiently at a reasonable cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area... to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Flexibility is the keynote with these C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons . . . discharge facilities can either be manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs. Future plant expansion is easily and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank and adding the supplementary discharge facilities at a later date.

Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-in High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-in Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

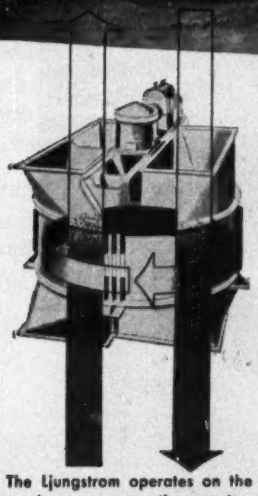
C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

Get Higher Throughput

Ljungstrom Air Preheater



The Ljungstrom operates on the continuous regenerative counter-flow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves, the heat is transferred from the waste gases to the incoming cold air.

With the process industries' production at all-time high levels — and climbing higher — here is a timely suggestion that may point the way to significant production increases in your plant — *without adding a single still.*

A Ljungstrom Air Preheater, properly combined with modern draft and burner equipment, can increase still production as much as 25%. At the same time, plugging is so much reduced that production lost to downtime will be astonishingly low.

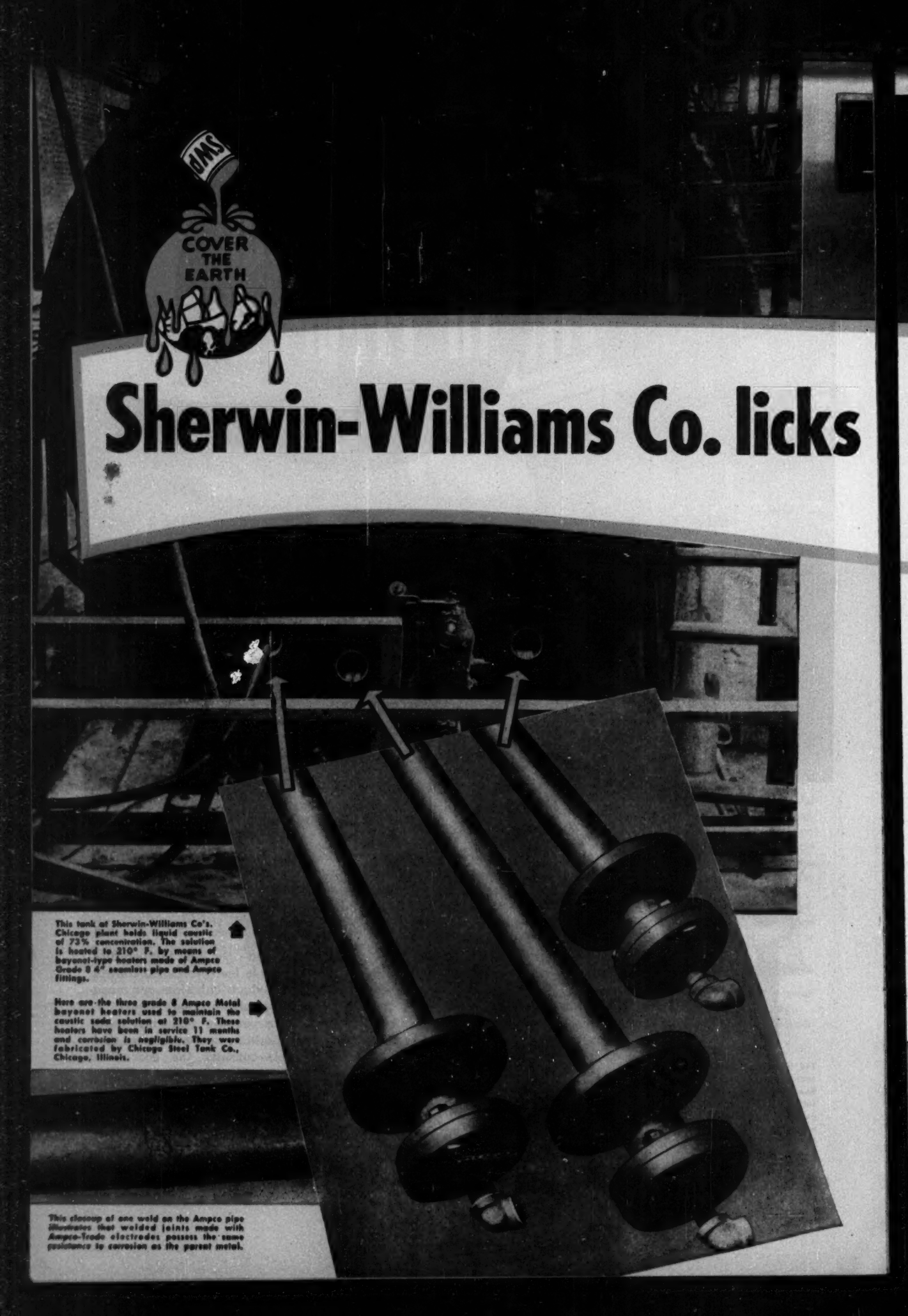
The value of the Ljungstrom Air Preheater lies in its ability to recover heat normally lost up the stack, and to return a large portion of it to the furnace zone in the form of preheated combustion air. Fuel requirements are drastically reduced and—where furnace capacity permits — throughput goes up considerably.

Furthermore — the finer temperature control possible leads to closer control of the end product. This alone can mean tens of thousands of dollars a year.

Wherever you are replacing, modernizing, or adding new equipment that burns fuel — consider the economies you can get with a Ljungstrom. Call or write The Air Preheater Corporation for complete information.

Wherever You Burn Fuel, You Need Ljungstrom

THE AIR PREHEATER CORPORATION 60 East 42nd Street, New York 17, N. Y.



Sherwin-Williams Co. licks

This tank at Sherwin-Williams Co's. Chicago plant holds liquid caustic of 73% concentration. The solution is heated to 210° F. by means of bayonet-type heaters made of Ampco Grade 8 4" seamless pipe and Ampco fittings.

Here are the three grade 8 Ampco Metal bayonet heaters used to maintain the caustic soda solution at 210° F. These heaters have been in service 11 months and corrosion is negligible. They were fabricated by Chicago Steel Tank Co., Chicago, Illinois.

This closeup of one weld on the Ampco pipe illustrates that welded joints made with Ampco-Trode electrodes possess the same resistance to corrosion as the parent metal.

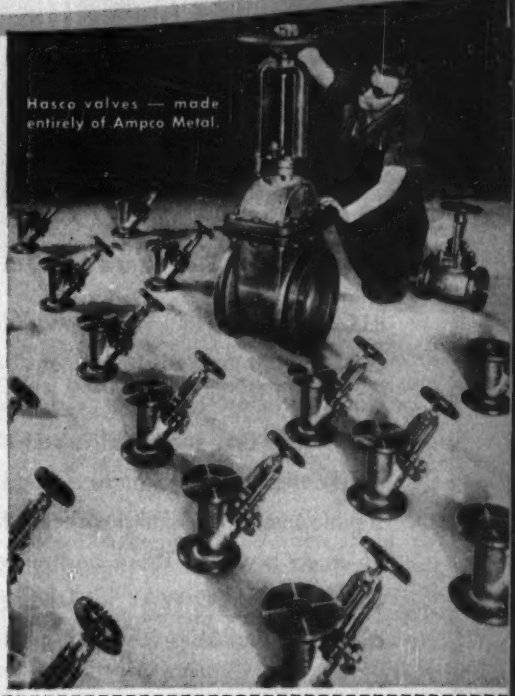
Overflow launders for potash flotation tank — made of Ampco Metal, welded with Ampco-Trode* electrodes.

CAUSTIC CORROSION *with* AMPCO* METAL

Like Sherwin-Williams Co., manufacturer of top-quality paints, an ever-increasing number of companies in the process and petro-chemical industries are using Ampco Metal to solve corrosion and many other problems.

Here's why! Ampco Metal Grade 8, one of a series of engineered aluminum bronze alloys, has these important properties: high resistance to corrosion...high tensile strength (75,000 psi)...high physicals at extreme temperatures... high strength-to-weight ratio... high impact and fatigue values (Charpy @ −423° F., 93 ft. lbs., @ 70° F. 75 ft. lbs. fatigue limit 28,000 lbs. @ 100,000,000 cycles)... high resistance to wear from erosion, abrasion, cavitation-pitting... high compressive strength (E. L. in Comp. 25,000 psi)... high modulus of elasticity (18,000,000)... easy to fabricate with Ampco-Trode* welding wire and coated electrodes.

Ampco Grade 8 has Boiler Code Approval and is available in sheet, plate, extrusions, pipe, tubes and fasteners. It may be the solution to your corrosion problems. Consult your nearest Ampco Field Engineer or write us for further information.



Hasco valves — made entirely of Ampco Metal.

Tear out this coupon and mail today!

*Reg. U. S. Pat. Off., Ampco Metal, Inc., Milwaukee, Wis.

Ampco Metal, Inc.
MILWAUKEE 46, WISCONSIN
West Coast Plant
BURBANK, CALIFORNIA

AMPCO

AMPCO METAL, INC., Dept. CS-2, Milwaukee 46, Wis.

Send me information on the application of Ampco Aluminum Bronzes for corrosion-resistant service in the Process Industries.

Name.....Title.....

Company.....

Company Address.....

City.....(.....) State.....

58-10

ionXchange

serving the outstanding plants of American industry

pioneers and leaders in ionXchange

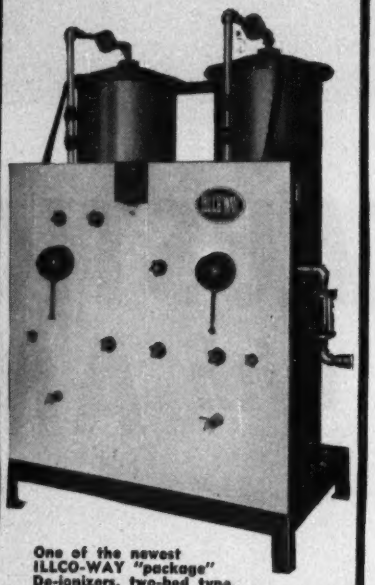
ILLCO-WAY "firsts" include manufacture of the first commercial two-bed De-ionizer . . . the first commercial mixed-bed De-ionizer . . . development and building of the first successful installation for beet-juice purification by ionXchange . . . and more recently the development of a similar process for the purification of crude glycerol. These and numerous other applications of ILLCO-WAY ionXchange technology are currently available for your products or processes.

ILLCO-WAY

DE-IONIZING
DE-ALKALIZING
SOFTENING

For complete data: see Sweet's File, Engineering, or Chemical Engineering Catalog

De-ionized Water in a "package"



One of the newest ILLCO-WAY "package" De-ionizers, two-bed type. Shipped completely assembled.

A complete line of standard (package-type) De-ionizers—for production of solids-free De-ionized water used for solution make-up, rinsing, sealing rinse after anodizing (flow rates from 100 to 1000 gph.).

Units are compact, shipped completely assembled and base-mounted for ease of installation and operation, requiring only connection to raw water, drain and treated water outlets.

Three types: Mixed-Bed and standard two-bed, with or without silica removal. Ideal production units; convenient for laboratory and pilot-plant research.

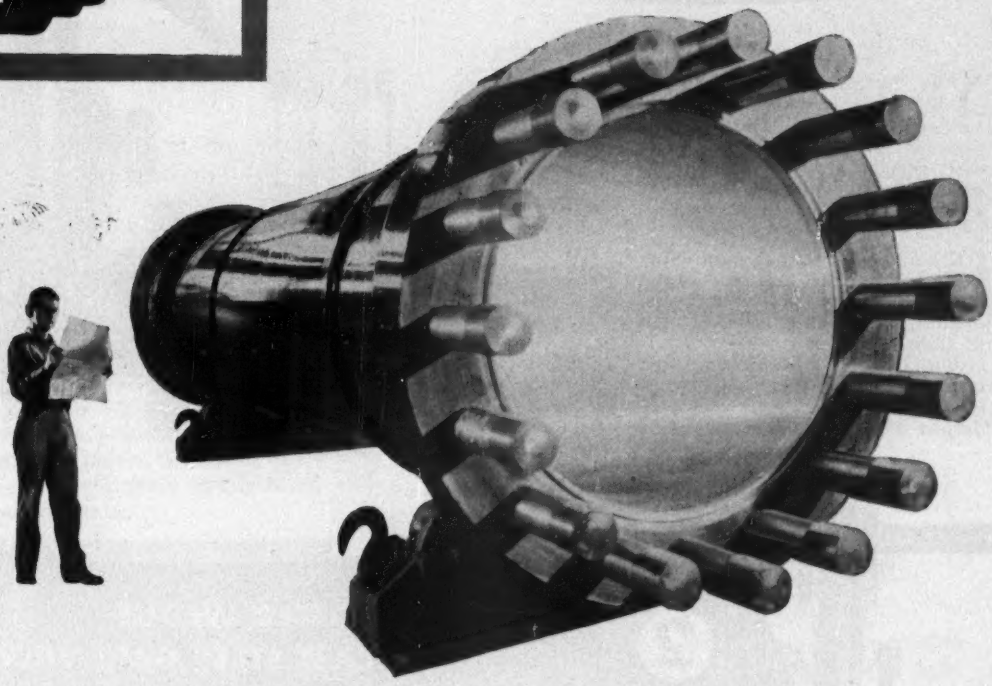
Send for your free copy . . .

of Bulletin PK-152, containing general unit specifications, complete description of equipment and performance data. Please write on company letterhead. Address: Illinois Water Treatment Co., 844-2 Cedar St., Rockford, Ill.

ILLCO-WAY

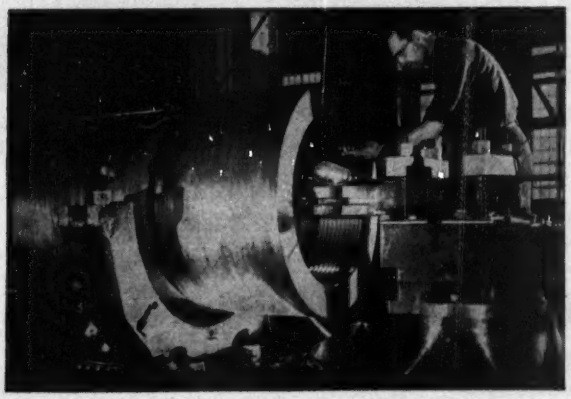
ionXchange

It's a Job for Careful Men



Building pressure vessels doesn't come under the heading of easy jobs. The steel must be made just so; the forging, treating, and machining can't be done hastily. This kind of work is a job for careful men.

We have them at Bethlehem. Men who know the importance of watching every detail. Men who know that the vessels they build must usually test at several thousand pounds per square inch. That sort of pressure doesn't leave room for any slip-ups, anywhere.



Bethlehem builds vessels for some of the world's most particular customers—evidence, we think, of the craftsmanship that goes into each job. That same brand of care is available to you when you're next in the market.

We are equipped to produce forged vessels of almost every size and type . . . reactors, filters, converters, separators, high-pressure accumulators, large autoclaves, etc. These can be of single- or multiple-section design, whichever the specifications require. Call or write us when future units are still in the blueprint stage; we'll gladly work with your technical staff in planning the vessel or vessels you need.

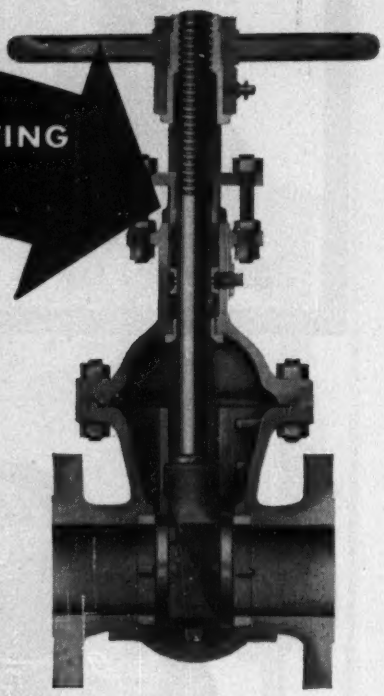
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

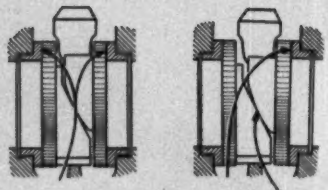
2 WAYS TO GET BETTER VALVE SERVICE!

1 ...UNIQUE DARLING DOUBLE REVOLVING DISC, CAST STEEL GATE VALVE



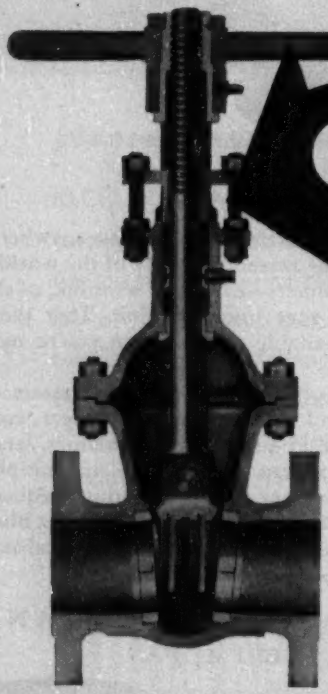
YES, here's a sure way to get better, more dependable valve service. Install this Darling gate valve of the fully revolving double disc, parallel seat type. Time after time users rate it number one for the elimination of down-time and repeated maintenance headaches.

Check the diagrams at right. Note how this Darling gate valve automatically compensates for body distortion, and resulting misalignment of seats. The upper wedge face is radiused, while the lower wedge face is straight, thus disc-to-seat pressure is equalized, assuring tight closure despite distortion and wear.



Discs and seats are parallel. *Seats forced out of parallel by body distortion but discs adapt themselves to give positive closure.* *Radiused face of wedge allows discs to adjust tightly against both seats.*

For foolproof simplicity in maintenance and reassembly, and unequalled service life, install this superior Darling Cast Steel Gate Valve.



2 ...DARLING SLOTTED WEDGE CAST STEEL GATE VALVE

HERE'S the second good way to get better valve service. This Darling gate valve's slotted wedge provides *flexibility* when it's needed! It automatically compensates for expansion and contraction due to temperature changes, avoids leaks and minimizes wear and tear on the wedge faces and seats.

What's more, the wedge has *double* guide grooves which engage twin ribs in the valve body. This provides twice the usual bearing area, assuring smooth trouble-free alignment every time!

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

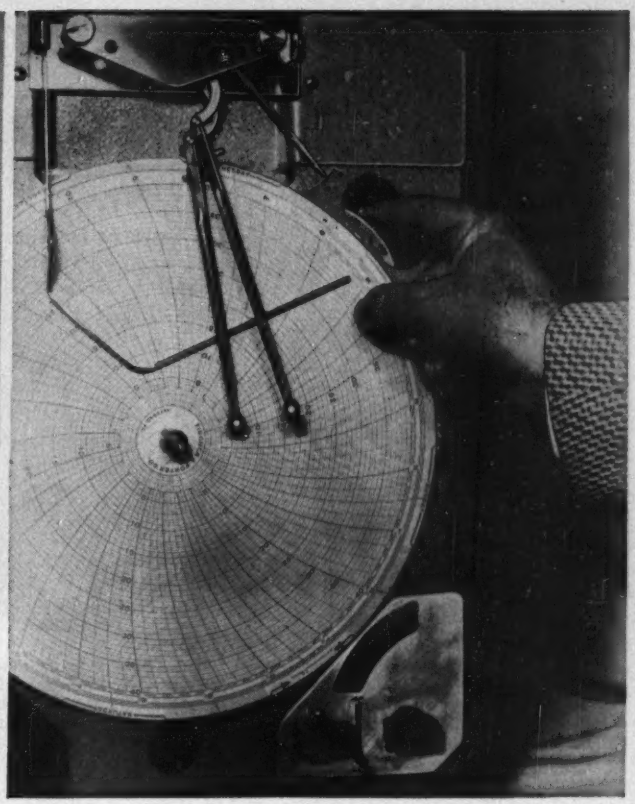
EVERY NEED. *Darling gate valves are made in a wide range of sizes, types and constructions for all kinds of normal and unusual service... and for pressures up to 1500 pounds.*

DARLING VALVE & MANUFACTURING CO.

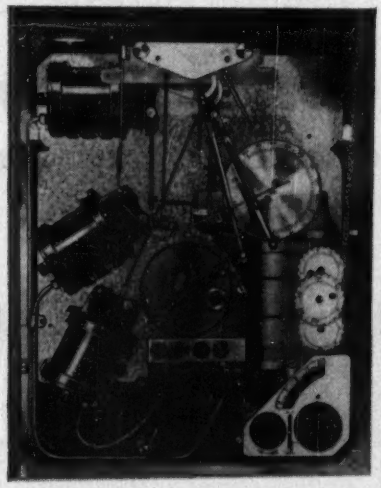
Williamsport 3, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

NEW
FISCHER & PORTER
automatic
FLOW RATIO CONTROLLER



Compact size with extreme precision of ratio control are important advances in this *new* Fischer & Porter Ratio Controller. Designed specifically for flow ratio control, it makes a perfect combination teamed with the new P-4 Pneumatrol and highly accurate Flowrator meters or variable area cell kinetic manometers, to assure accurate and dependable ratio control of fluids, gases or slurries. Receives pneumatic, electrical, or electronic primary signals. Review the features below, then mail the handy coupon for complete engineering and application data.



Interior view of standard Ratio Controller with pneumatic set ratio adjustment.

The compact stack mounting of the new Ratio Controller atop the P-4 Pneumatrol provides the simplest possible unit. The large (10½" scale) ratio setting dial permits precise ratio settings which are visible through the door. F&P wide range, linear scale primaries give extreme range of ratio (6:1 to 1:1 to 1:6; a total of 36:1).

CHECK THESE FEATURES:

- Extreme flexibility
- Wide range of ratio
- Based on linear scale primaries
- Control deviation indicator
- Primary element fully corrosion resistant
- Highly visible ratio setting dial
- Extremely compact stack mounting

© 1717

TRADE MARK
FLOWRATOR

FISCHER & PORTER COMPANY

520 COUNTY LINE ROAD, HATBORO, PENNA.

Please send me by return mail complete information on your new Ratio Controller.

NAME_____ POSITION_____

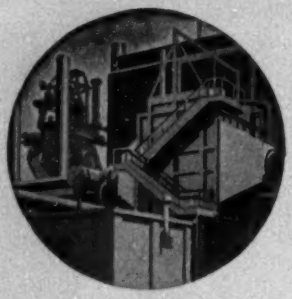
COMPANY_____

ADDRESS_____

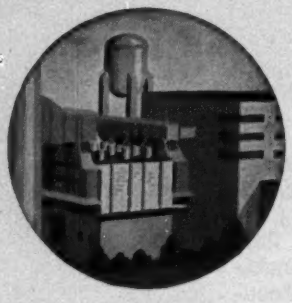
CITY_____ ZONE____ STATE_____

War on waste!

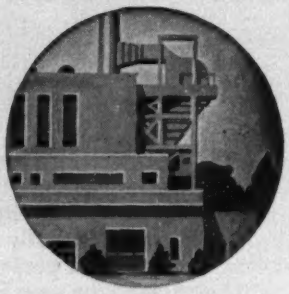
American industry is continually searching for new ways to stop waste and increase production and efficiency. A good example of this is the Koppers-Elex electrostatic precipitator. Shown below are a few typical ways industry uses them to combat waste . . .



BLAST FURNACE GAS must be cleaned before it can be used as a fuel. Koppers-Elex electrostatic precipitators clean this gas to residuals as low as .002 grain per cubic foot.



FLUE GASES from recovery boilers in pulp mills contain valuable materials. Koppers-Elex electrostatic precipitators recover several hundred thousand dollars worth of these materials yearly.



FLY ASH from power plants and factories may drop a blanket of dust extending three to five miles. Koppers-Elex electrostatic precipitators stop this nuisance and preserve public good will.

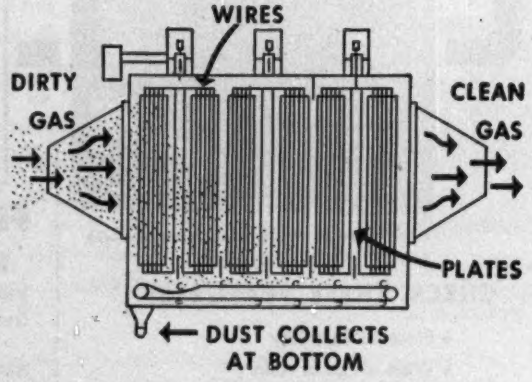
Guaranteed: All Koppers-Elex electrostatic precipitators are guaranteed to equal or better (under tests made by your own personnel) any efficiency or residual content you specify.

ENGINEERS! You should know about these six design features of Koppers-Elex electrostatic precipitators!

KOPPERS has made sweeping improvements in electrostatic precipitator design! For example, double chambers eliminate expensive by-pass systems and the resultant loss of materials during inspection or maintenance. And re-entrainment is sharply reduced because rapping is sectionalized.

Successive collection zones are separately energized to provide maximum voltage for highest collection. And because each field is, in effect, a separate precipitator, the outage of one field *does not stop* gas-cleaning action. In addition, completely enclosed and compact "package" mechanical or vacuum tube power packs simplify installation and operation.

Another exclusive Koppers feature is the drag scraper which provides continuous dust removal, eliminates plugged hoppers and prevents bothersome dust build-up. For detailed information on recovery, gas-cleaning or nuisance abatement results write today to: Koppers Company, Inc., Precipitator Dept., 212 Scott Street, Baltimore 3, Md.



If you have a gas-cleaning problem, write today to: Koppers Company, Inc., Precipitator Dept., 212 Scott St., Baltimore 3, Md.

KOPPERS®

Koppers-Elex ELECTROSTATIC PRECIPITATORS

FEinc Rotary Vacuum Filter used by Davison Chemical Corporation in production of micro-spheroidal silica-alumina cracking catalysts.

SILICA GEL ...HANDLED BETTER FASTER, WITH FEinc's STRING DISCHARGE

The same type of String Discharge that handles cakes ranging from thin slimes to thick, heavy sludges . . . lifts this viscous hydro-gel cleanly from the filter cloth. There's no smearing, blinding, or plugging of the fabric. At the same time, the FEinc Compression Mechanism gives a drier, easier-to-handle cake.

The superior features of the String Discharge make rotary vacuum filtration possible on many processes that were formerly handled by costly "stop-and-go" methods. FEinc filters handle a wide variety of processes and products . . . are easily adapted to almost any type of work.

Find out more about what these versatile, efficient filters can do for *your* process . . . write us today.

HOW TO LEARN MORE ABOUT FEinc FOR YOUR PROCESS....

1 FREE TESTING SERVICE

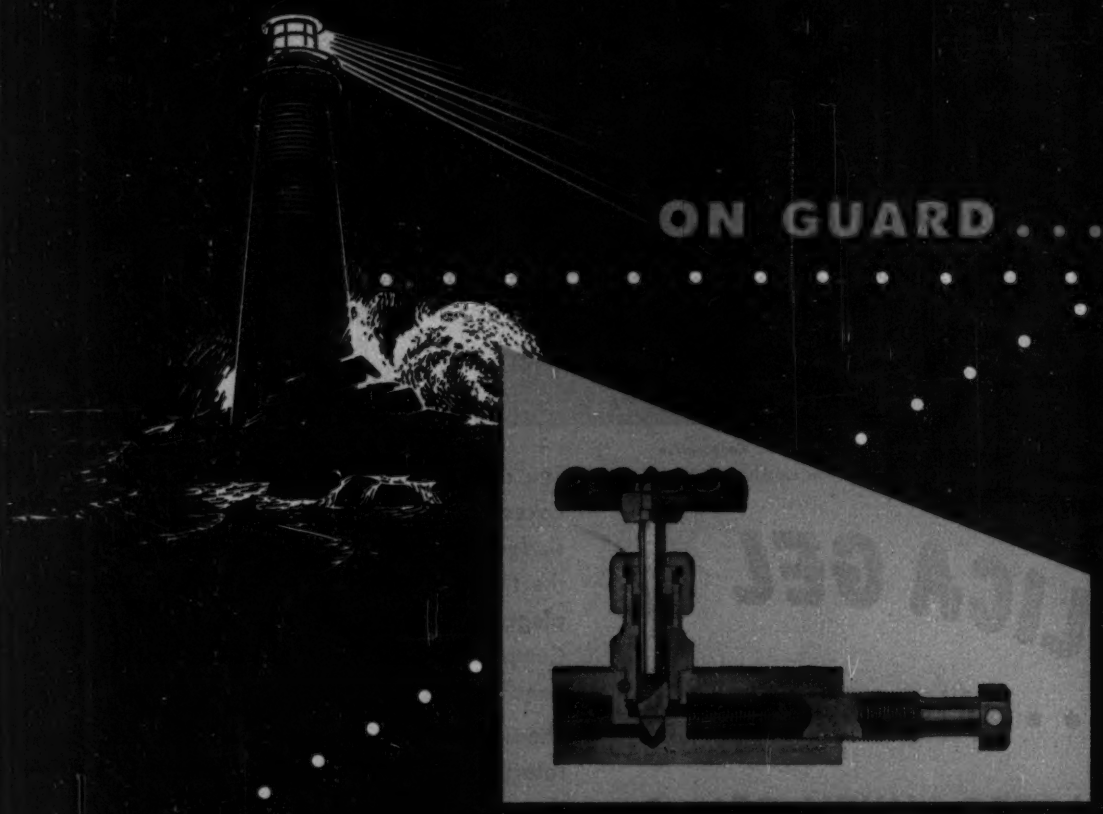
At no expense to you, we'll test your slurry and send you a complete report on what FEinc filters can do for you. In your plant, without interrupting your process, or in our laboratory, with a 5-gallon sample of your slurry. Send it today!

2 PILOT PLANT FILTER

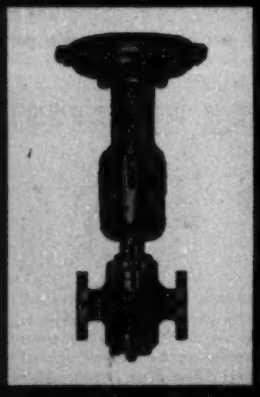
RENT this small but complete rotary filter. Has all FEinc features, plus interchangeable scraper discharge. No capital investment is required, and a generous part of the low monthly rental can be credited against the future purchase of any FEinc filter. Write today for details.

FILTRATION ENGINEERS INC.

155 ORATON STREET • NEWARK 4, NEW JERSEY



for safe, easy stem lubrication



The isolating valve in the stem lubricator of the Honeywell Series 700 Valve affords maximum safety against leakage when replenishing stem lubricant . . . tight fitting conical plug and machined seat assure leakless shut-off . . . pinned bonnet prevents accidental removal. The Honeywell Series 700 wide band proportional valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-2.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Avenue, Philadelphia 44, Pa.

MINNEAPOLIS

Honeywell

VALVE PRODUCTS

First in Controls

Pumps that Give You Peace of Mind

Handling a coagulating solution calls for pumps that need no excuses. If performance falters, even briefly, expensive troubles can result. And if the pumps are not metallurgically exact, there is the possibility of staining the end product with consequent destruction of value.

So this manufacturer turned to LaBour, because LaBour pumps have an unequalled reputation for staying on the job. Moreover, LaBour's nearly 30 years of experience in serving the chemical industry has created foundry methods that assure meticulous adherence to metallurgical specifications. The pumps in the picture are non-priming, and the hydraulic job (300 G.P.M. against a 70 foot head) isn't difficult, but this buyer wasn't willing to take a chance with anything less than a LaBour.

Can you afford to take chances on your pumping jobs? When you specify LaBour, there will be no grounds for anyone to question your judgment, no matter what happens. You'll get true pumping economy as well as peace of mind when you put LaBour's on the job.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.

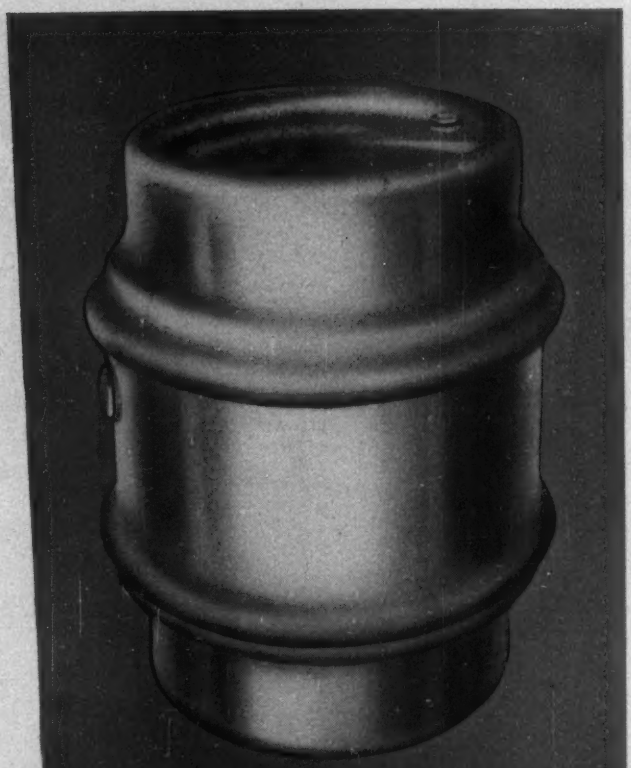
ANNOUNCING THE APPOINTMENT OF

REYNOLDS METALS COMPANY

AS EXCLUSIVE SALES REPRESENTATIVES FOR

BENSON ALUMINUM DRUMS

FOR THE CHEMICAL INDUSTRY



Benson Aluminum Chemical Drums are now used to ship—acids, alcohols, aniline, fats and oils, liquid fertilizers, formaldehyde, hydrazine, hydrogen peroxide, inflammables and explosives, insecticides and poisons, premium petroleum products, propellants and many specialized products of the process industries.

Contact your nearest Reynolds Sales Office or write direct for free catalog describing the various models of Benson Aluminum Drums. Reynolds Metals Company, 2567 South Third Street, Louisville 1, Kentucky.

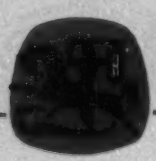
★ OUTLAST AND OUTPERFORM OTHER TYPES OF SHIPPING CONTAINERS . . . OFFER TREMENDOUS SAVINGS IN REPLACEMENT COSTS ALONE!

★ COMPLETELY RUSTPROOF . . . REQUIRE NO PAINTING, INTERIOR COATINGS OR COSTLY MAINTENANCE OF ANY KIND!

★ LIGHT WEIGHT CUTS SHIPPING AND HANDLING COSTS!

★ PROTECT CHEMICALS AGAINST CONTAMINATION AND SPOILAGE!

★ STRONG, DURABLE . . . LAST FOR YEARS AND YEARS!



REYNOLDS ALUMINUM

SALES AGENTS FOR BENSON CHEMICAL DRUMS

Providing the sinews to bite through steel

Transmitting power to shear through steel pipe requires a drive of rugged strength. The Foote Bros. Hygrade Worm Gear Drive selected for this service provides the maximum in quality and high efficiency due to advanced engineering — improved design — new techniques in manufacture and better control of material.

Whatever your requirements in enclosed gear drives, you will find one just suited to your needs in the complete Foote Bros. line. A size and type of drive for every need.

Crop End Saw built by The Enterprise Company, Columbus, Ohio, for National Tube Division of United States Steel Company.

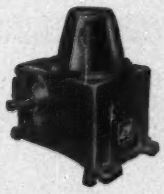
HYGRADE A COMPLETE FAMILY OF ENCLOSED DRIVES

TYPE S
Horizontal right angle worm gear drive. Ratios up to 71 to 1. Cap. up to 266 h.p.

TYPE X
Right angle helical — worm gear drive. Ratios up to 196 to 1. Cap. up to 71 h.p.

TYPE V
Vertical right angle drive, output shaft up, down, or both. Ratios up to 4108 to 1. Cap. up to 216 h.p.

TYPE D
Horizontal double worm gear drive. Ratios up to 4108 to 1. Output torque to 253,000 in. pounds.



TYPE VW
Hytop vertical right angle drive for long, unsupported output shaft extensions. Same ratio and capacity range as TYPE V.

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. CE, 4545 South Western Boulevard, Chicago 9, Illinois

Please send me Bulletin HGB on FOOTE BROS. Hygrade Worm Gear Drives.

Name.....

Company.....

Position.....

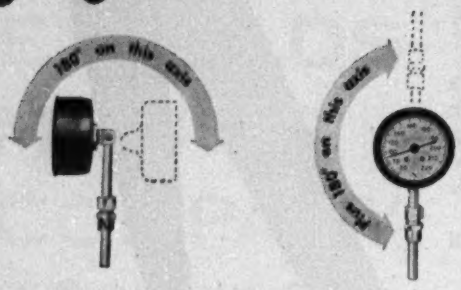
Address.....

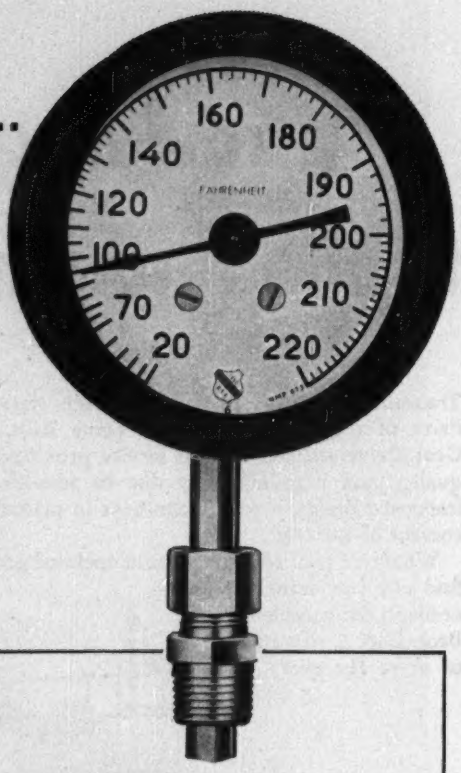
City..... Zone..... State.....

Better ANY WAY YOU LOOK AT IT...

AMERICAN

"*Every Angle*" DIAL THERMOMETER





The American "Every Angle" Dial Thermometer is easy to install and turn to any position for accurate face-to-face readings. Specify the "Every Angle" — indoor or outdoor design — and this unbeatable feature combination is yours:

DEPENDABLE ACCURACY. The "Every Angle" Thermometer is made of precision-machined, non-corrosive materials and operates by vapor pressure. It is precisely calibrated against certified standards to assure the most critical reading in the upper third of the dial, where the graduations are farthest apart.

CONVENIENCE. Dial face can be rotated 180° and tilted 180° for accurate reading at the most convenient angle.

WEATHER-PROOF DESIGN. *Screw-type ring* with tight-fitting gasket for weather-proof outdoor service; *slip ring* design for indoors.

REINFORCED MOUNTING. Heavy-gauge swivel hinge has a *stainless steel kingpin.* Reinforced connection between hinge and bulb. Greater strength and corrosion resistance, long service life!

EASY INSTALLATION. Socket connections have compression-type bushings. No costly jigs needed — connection easily welded to tanks or other irregular-shaped equipment.

Ask your Distributor to help you select the American "Every Angle" Dial Thermometers with the proper temperature ranges for your needs. Phone or write him today.

SPECIFICATIONS

NON-CORROSIVE DIAL CASE: Non-corrosive aluminum with smooth black finish. No protruding screw heads. Nickel-plated brass cup houses coiled capillary tubing.

DIAL: 3½" diameter. White with black figures. **POINTER:** Black, adjustable. **FRONT:** Heavy plate glass. **MOVEMENT:** Bronze or stainless steel. **BULB AND STEM:** Stainless steel. **SIZE CONNECTION:** ½", N.P.T. **STEM-LENGTHS:** 3", 5-5/16", 12", 18" and 24". **SEPARABLE SOCKETS:** Bronze, carbon steel or stainless steel.

STANDARD RANGES

Fahrenheit	
—60 to 20°	30 to 300°
—20 to 120°	100 to 300°
40 to 140°	90 to 350°
30 to 180°	190 to 390°
20 to 220°	260 to 450°
Centigrade	
0 to 100°	40 to 150°

YOUR INDUSTRIAL DISTRIBUTOR makes it his business to see that you get the best possible equipment. That's why he handles only products of proved quality and dependability — like Manning, Maxwell & Moore products.

AMERICAN INDUSTRIAL INSTRUMENTS

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

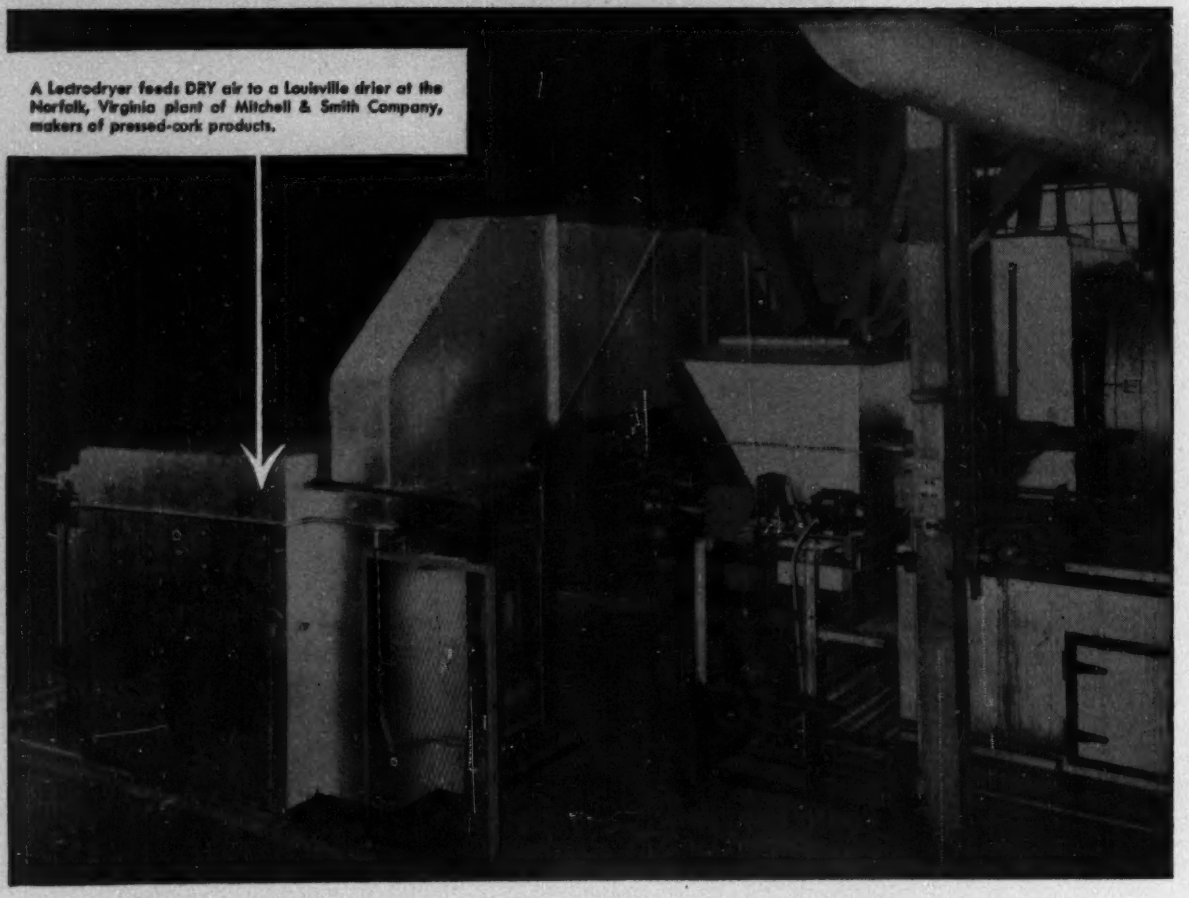
Appearances Can Be Deceiving

You can be fooled by steel castings, too. Many faults . . . internal flaws — improper composition — non-uniformity . . . may be concealed by a perfect finish . . . but nevertheless present to make a casting unsound — unsuited for an exacting job. That's why rigid metallurgical control, precision labor techniques, and many painstaking inspections play such an important part in the production of Sivyer castings. Manufacturers who demand longer service life and extra dependability know that a casting must measure up to the highest standards of the industry to bear the famous Sivyer Ⓢ Look for it.

SIVYER

SPECIALISTS IN HIGH ALLOY AND SPECIFICATION STEEL CASTINGS

SIVYER STEEL CASTING COMPANY • MILWAUKEE Ⓢ CHICAGO Ⓢ MAIN OFFICE: 1675 SO. 43rd ST. • MILWAUKEE, WIS.



A Lectrodryer feeds DRY air to a Louisville drier at the Norfolk, Virginia plant of Mitchell & Smith Company, makers of pressed-cork products.

DRY AIR is part of their formula in blending powdered cork

Formulation of cork products calls for some water, but not as much as the raw cork usually contains. Some of the moisture must be removed by tumbling the powdered cork in a rotary drier, through which heated DRY air is passed.

Lower air temperatures—desirable to prevent injury to the cork—can be employed when that air is preconditioned by a Lectrodryer,* since DRY air removes moisture faster.

You can make DRYing a part of your formulas by installing Lectrodryers to remove unwanted moisture from air, gases and organic liquids. Delicate chemical reactions can then be held on the straight and narrow path more easily. Low humidity in workrooms and storage areas prevents contamination of materials that pick up water. It keeps them moving freely in machines and conveyors, speeding up production.

For help in adding DRYing to your processes, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Penna.

In England: Bidec, Limited, Tyburn Road, Erdington, Birmingham.

In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Chemin, Bressoux-Liege.

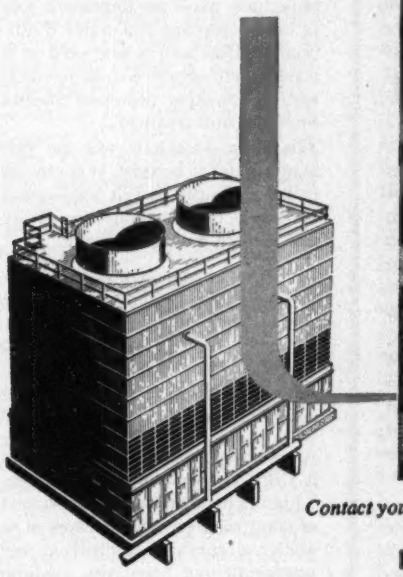
LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

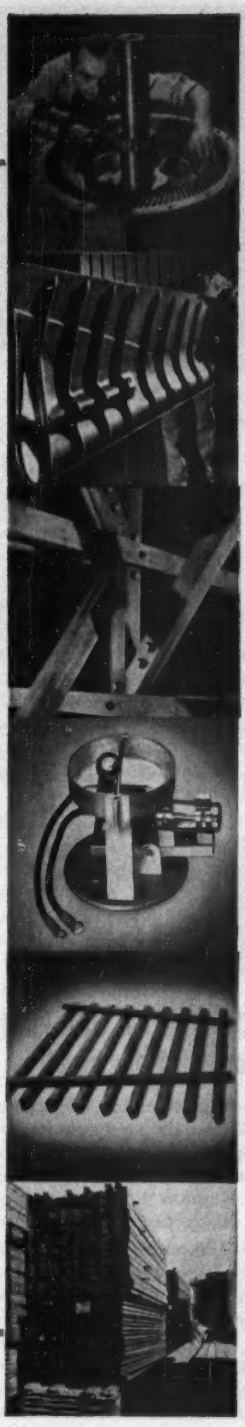
LECTRODRYER

*REGISTERED TRADEMARK U.S. PAT. OFF.

ONLY FLUOR

induced draft counterflo cooling towers provide these 6 exclusive features...





Spiral Bevel Gear Speed Reducers

Only Fluor-Western speed reducers incorporate curved tooth spiral bevel gears as standard design. This proven principle provides quieter, smoother, more efficient operation under the rugged conditions of cooling tower service. Other special design features include: oil-bath lubrication; dry air breather; chrome-plated shaft at oil seals; and, low-speed fan shaft mounted on special steep angle thrust and radial bearings to take combined gear thrust, fan thrust, and weight of fan assembly.

Unique Fan Blade Design

The Fluor Type HC Stainless Steel Fan blades, furnished as standard on every Fluor Counterflo Cooling Tower, are a joint development of The Fluor Corporation and Solar Aircraft Company. Designed specifically for induced draft cooling tower service, their unique air foil handles maximum air volumes at minimum tip speeds and horsepower requirements. Design *plus* mechanical arrangement eliminates recirculation of air and resulting power-consuming turbulence.

Internal Gusset Plate Construction

Fluor Counterflo Cooling Towers alone make full use of tensile as well as compressive strength of structural members! Their internal gusset plate design duplicates that used in wooden bridge construction. These simple, yet extremely strong joint connectors mean longer tower life, lower total tower weight, fewer and simpler castings, greater ease of erection, and minimum spoilage should the structure be dismantled, moved and re-erected.

Patented Vibration Cut-Out Switch

The Vibration Cut-Out Switch developed and patented by Fluor in 1944 protects tower structure and mechanical equipment by stopping the motor should excessive vibration suddenly occur. In addition to its value as an emergency safety device, the switch can be utilized by the operator as a positive "on-off" switch during routine inspection of tower structure and mechanical equipment. The motor cannot be started accidentally once the switch is placed in the "off" position.

Sloping-Bar Grid Decking

Exclusive Fluor-designed sloping-bar grid decks are of rough-finished 1" select redwood machine-nailed to 1" x 2" cleats—strong enough for use as scaffolding during erection, rugged enough to withstand the erosion of falling water. This means low maintenance and replacement cost. The sloping-bar design and arrangement of each deck cross member combines the advantages of maximum deck surface with minimum air pressure drop through tower.

Complete Prefabrication of Structure

Only Fluor Counterflo Cooling Towers are completely prefabricated. This offers many advantages to the operator. Tower parts are "packaged" for rapid delivery, marked for orderly erection. Erection is faster, easier, at lower cost. All cutting, drilling and nailing is completed at the factory. Prefabrication means standardization—low-cost replacement of standard parts that may become damaged over the years. It means uniformity in both performance and appearance.

Contact your nearest Fluor representative for detailed information. You Can Be Sure With Fluor

FLUOR

Engineers - Constructors - Manufacturers

THE FLUOR CORPORATION, LTD. • LOS ANGELES • HOUSTON

New York, Chicago, Pittsburgh, Boston, Tulsa, San Francisco, Birmingham and Calgary

Represented in the Sterling areas by:
Head Wrightson Processes Ltd., Teesdale House, Baltic Street, London, E.C.1, England

for your information...

brief summaries of helpful product news

New DOP Plant Offers Several Major Advantages To All Vinyl Compounders

The recent addition of a DOP plant at Everett, Mass., emphasizes these advantages offered by Monsanto to its DOP customers:

1. New facilities give even greater assurance of a continuing source of supply.
2. Contracts are written for the length of time requested.
3. Monsanto offers technical service on plasticizer problems.
4. Prompt shipments are assured—from bulk stations at St. Louis, Akron, Long Beach, Calif., Perth Amboy, or Everett, Mass.
5. Shipments may be delivered in compartmented tank cars, tank wagons or drums.
6. Monsanto DOP is made to rigidly maintained quality specifications.

For more information on prices and delivery, send in the coupon.

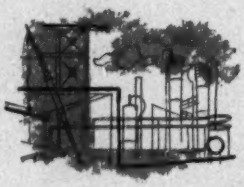
Monsanto Methyl Salicylate Has Another New Application

Methyl salicylate, synthetic oil of wintergreen, has a new job.

This compound has been widely used as a pharmaceutical product; as a flavoring agent in foodstuffs and beverages; and as an odorant in printing inks and insecticides.

The new use, strangely enough, has nothing to do with any of these fields. Now methyl salicylate is being used as a major ingredient in penetrating oils, because it has a lower surface tension than water. These oils—as the name implies—are used wherever an oil is required which can sink in and loosen up springs and machinery. Experience has shown that methyl salicylate is especially effective at increasing the penetrating power of the oils and reducing the frictional forces involved.

Monsanto's methyl salicylate is a clear, colorless liquid and assays approximately 100%; weighs 9.9 pounds per gallon; conforms to U.S.P. in every respect. For information on shipment and pricing mail the coupon.



West Coast to Get New Plant For Production of Phenol

Construction contracts have been awarded for building a new phenol plant on an 86-acre site in Avon, California. The new plant will be another addition to Monsanto production facilities on the West Coast.

Site preparation and service facilities have been under construction since July and the construction of manufacturing facilities will begin shortly. The plant will be operated jointly by Monsanto's Western and Organic Chemicals Divisions. Plans call for full operation by early 1954.

The phenol will be available to supply an increasing demand on the part of West Coast industry as well as in the company's own manufacturing operation. Monsanto produces a variety of phenolic resin adhesives for the plywood industry and for laminates, in addition to industrial phenolic resins for wastewood boards and rock-wool insulation binding.

Monsanto Plants Manufacture Basic Line of Phosphates For Many Industrial Uses

Today—more than ever before—phosphates are a basic chemical family serving all industry.

Phosphorus itself is used to turn soft brass into hard phosphor-bronze . . . into machine bearings and crankcase sleeves that resist heat and keep industry's wheels speeding in smooth, frictionless seats.

In addition to its applications in industry, phosphorus is also used by the armed forces as a smoke-producing agent and in numerous other important applications.

When phosphorus is processed into phosphoric acid, still more uses are made possible. Phosphoric acid is used in soft drinks . . . as a catalyst and oil-refining agent . . . in the electropolishing of metals . . . in clarifying raw sugar syrups . . . in rustproofing compounds . . . and in many other important applications.

The sodium salts of phosphoric acid are important, too. Monosodium phosphate plays an important role in metal cleaning and water conditioning. Disodium is also used as a water conditioner as well as an emulsifier for making processed cheeses smoother and creamier.

Trisodium phosphate was the first soap builder to be used. It continues to be a favorite in this application because of its water-softening ability and its high detergency value.

Another valuable salt of phosphorus is TSPP, tetrasodium pyrophosphate. This is an important component of many soap powders because of its ability to combine emulsifying and water-softening properties. Sodium tripolyphosphate is also used in the water-conditioning field where high solubility and calcium-sequestering power are required.

Phosphates also play a key part in the baking field. Sodium acid pyrophosphate and monocalcium phos-

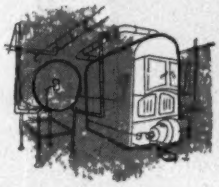
phate act as leavening agents which combine with other ingredients to release the carbon dioxide which makes baked goods rise.

Another phosphate salt, dicalcium phosphate, is an important addition to farm feeds. In this application it furnishes phosphorus in a form that is readily available to the animal.

A third salt, tricalcium phosphate, is used as a base for toothpastes where a mild abrasive action is required. It is also mixed with table salt to render it more free flowing.

Phosphoric acid also forms potassium salts. These can be used to control acidity of bacteriological culture media in the manufacture of penicillin . . . to act as a nutrient in the growth of plants.

Monsanto—manufacturer of one of the most complete lines of phosphate compounds—will be glad to show you what phosphates can do for *your* business.



New Fuel Oil Additive Reduces Rusting, Cuts Screen Clogging in Burners

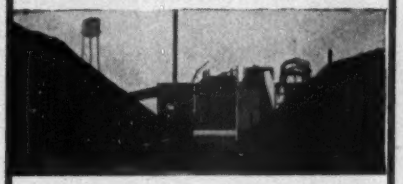
A new, nonmetallic, ashless oil additive has now been developed to control tip fouling in oil burners. The additive also reduces sediment formation and largely eliminates clogging of screens and filters by many fuel oils. In addition to its other properties, this additive is an effective rust inhibitor.

The new additive—called Santolene* H — inhibits the sediment which usually originates with so-called color bodies present as unstable components in the fuel oil. By inhibiting progressive polymerization of these unstable compounds, Santolene H effectively retards the formation of insoluble particles which ordinarily constitute much of the sediment found in fuel oils. Sediment particles in combination with water, rust and other solids make up fuel-oil sludge. The rust and sediment inhibiting properties of Santolene H aid in reducing sludge formation.

Santolene H also minimizes filter and screen clogging. The unique surface action of the additive enables particles to pass harmlessly through filters and screens, thereby eliminating a common cause of failure.

While Santolene H inhibits rusting of transmission and storage equipment, it does not react to form oil-water emulsions (hazing), nor is it depleted by water extraction.

For more details on this new additive, mail the coupon.



Largest Electric Furnace Starts to Produce Tons Of Elemental Phosphorus

There's something new to be seen along the old Oregon Trail. Here in the town of Soda Springs, Idaho, a giant new chemical operation is now underway—the world's largest electric furnace for producing elemental phosphorus has begun tonnage production.

The operation of this new furnace represents the culmination of several years' work and effort by Monsanto. For three years Monsanto's Phosphate Division experts scouted mineral deposits, plant sites, power sources and transport in the Rocky Mountain area. Finally in mid-1951, the multimillion-dollar plant began going up at Soda Springs, deep in the heart of the world's largest known deposits of phosphate ore.

The plant bolsters Monsanto's position as the world's biggest producer of elemental phosphorus. It gives Monsanto a greater percentage of the nation's total elemental phosphorus output—and more furnaces will be built in the future.

Today when visitors visit this thriving new chemical enterprise, they are usually surprised by the size of the operation. Rugged power shovels can be seen taking huge 10-yard bites of phosphate ore and dumping it into specially designed, cantilevered trucks—trucks that can haul *25 tons* at a load.

The ore is carried by trucks to the plant, and that is the last glimpse anyone has of the phosphate until it is transformed into phosphate salts which are used for everything from polishing agents in toothpastes to sudsers in soaps and detergents.

The ore, in the furnace, is mixed with coke and silica sand. The resulting reaction reduces phosphorus pentoxide to elemental phosphorus vapor. This vapor is changed into a liquid and pumped in molten form to tank cars. These cars carry it to Monsanto plants at Trenton, Mich., Monsanto, Ill., and Carondelet, Mo., where it is changed into phosphoric acid and countless phosphate salts.

Quick Facts On Chlorosulfonic Acid

Chlorosulfonic acid, also known as sulfuric chlorohydrin, has a molecular weight of 116.53 and is liquid in form. It is used as an intermediate and has proved itself in the dye field and pharmaceutical industry. It is generally most valuable in chlorosulfonation reactions.

The acid is a very heavy mobile liquid. You can obtain it in 700-pound, 55-gallon steel or stainless-steel drums, and in tank car shipments. For more information send in the coupon.

Other important heavy chemicals made by Monsanto for industry include: sulfuric acid, nitric acid, muriatic acid, mixed acid, sulfur dioxide, zinc oxide, technical; salt cake, sodium sulfate, Santosite* (sodium sulfite anhydrous) and Santotan* KR (basic chrome sulfate).

*Reg. U. S. Pat. Off.

MONSANTO CHEMICALS—PLASTICS

MONSANTO CHEMICAL COMPANY
1700 South Second Street, St. Louis 4, Missouri

Please send information on:

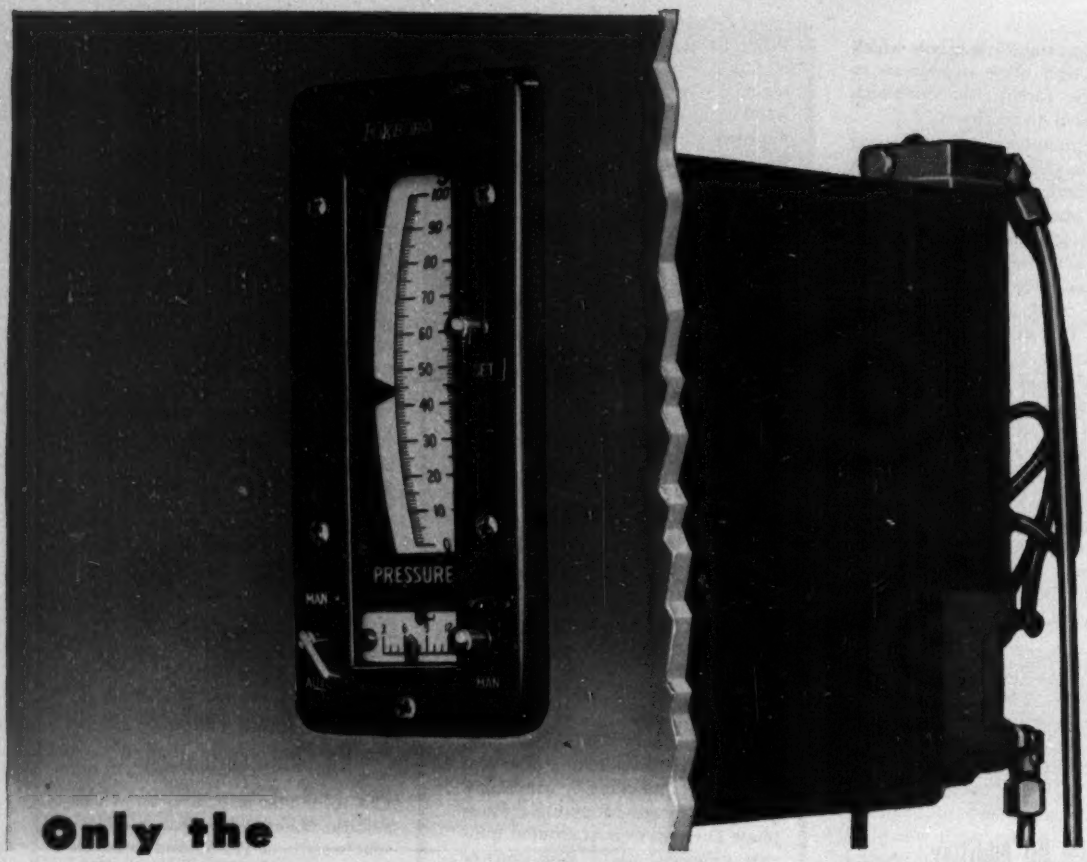
☐ DOP ☐ Methyl Salicylate ☐ Santolene H ☐ Phenol ☐ Chlorosulfonic Acid
☐ Phosphorus ☐ Phosphates for use in.....

Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....



Only the

CONSOTROL M/52

gives you all these advantages!

For indicating control functions in your console or graphic panel instrumentation, no other controller offers so much for so little money as the Foxboro Consotrol M/52 Indicating Controller. Compare these combined advantages:

1. **A completely self-contained, compact, panel-mounted Indicating Receiver Controller** that costs up to 20% less, installed, than usual graphic panel indicating control.
2. **Simple installation** — only 2 connections besides the air supply.
3. **Pull-out feature** that provides complete accessibility of control mechanism from front of panel.
4. **Instrument-type pressure transmitter for driftless** remote manual control, instead of usual pressure regulator.
5. **Simple 2-position transfer switch** and "foolproof" transfer indicator provide absolutely bumpless transfer.
6. **Graphic panel compactness** — takes only 3¾" x 7⅞" of panel space.
7. **"Full-size" performance** — control action unsurpassed by the finest conventional-size controllers. Available in Proportional, Proportional with Reset, Proportional with Derivative, Proportional with Reset and Derivative, and On-Off.
8. May be used with separately-mounted recorder using conventional circular charts. Up to 6 records may be combined on one chart with the Foxboro Multi-Record Recorder. (Consotrol Recorder-Controllers, featuring full scale 4" strip charts, also available.)

Get full details of this space-saving, cost-saving instrumentation. Write for Bulletin 362 describing the complete Consotrol Line of graphic panel instruments. **The Foxboro Company, 3610 Neponset Ave., Foxboro, Mass., U. S. A.**

FOXBORO
REG. U. S. PAT. OFF.

RECORDING · CONTROLLING · INDICATING
INSTRUMENTS

specially formulated to resist acid, alkali and sulphide fumes

FUMEX
the fume resistant
WHITE enamel
that stays WHITE!
ACID TEST
Discs are placed face down over beaker of concentrated Hydrochloric Acid for 24 hours.
ALKALI TEST
Discs are placed face down over beaker of concentrated Ammonium Hydroxide for 24 hours.
SULFIDE TEST
Discs are placed face down over beaker of concentrated Ammonium Sulfide for 24 hours.
FUME RESISTING ENAMEL A
FUME RESISTING ENAMEL B
FUMEX

Fumex is most resistant to acid, alkali, sulfide and chlorine fumes with minimum of fading and reaction (see test proofs on photos).

For interior surfaces only . . . for brick, concrete, plaster, wood, metal. All surfaces to be treated first with Fumex undercoater.

White only . . . supplied in semi-gloss finish.

Washable . . . withstands washings at regular intervals.

Application . . . by brush or spray.

CE-53

A. C. HORN COMPANY, INC.,
Long Island City 1, N. Y.

Please send me ☐ complete data on FUMEX

HORN ☐ free copy of your 106-page Construction Data Handbook

NAME _____ TITLE _____

FIRM NAME _____

ADDRESS _____

CITY _____ STATE _____

A. C. HORN CO., Inc. est. 1897

Manufacturers of materials for building maintenance and construction
LONG ISLAND CITY 1, N. Y. • Los Angeles • San Francisco • Houston
Chicago • Toronto SUBSIDIARY OF SUN CHEMICAL CORPORATION

REPUBLIC
INSTRUMENTS
AND CONTROLS

Do You Know About ALL of the **REPUBLIC** *Line?*

Check the Republic line of measurement and control equipment listed below. You'll find instruments and controls to meet your needs—whether for a simple control or an automatic control system. And teamed with this equipment is an experienced engineering staff which can give you the right answer to your measurement and control problems.

☐ **ELECTRICAL FLOW METERS.** For metering the flow of steam, water, gas, air, oil, brine, etc. The reading instruments, indicator, recorder and integrator, are remote reading and can be supplied singly or in any combination desired. Integration is continuous, an exclusive Republic feature.

☐ **PNEUMATIC TRANSMITTERS.** For converting process variables such as flow, liquid level, pressure, or liquid density into air pressures which vary proportionally with the process variables. These air pressures can be used as a measuring impulse for the actuation of an automatic controller or a direct reading recorder.

☐ **CO_2 METERS.** Provide a continuous record of percent CO_2 in flue gas measured by the Orsat method. Furnished with either mechanical or electrically actuated remote reading indicator and recorder.

☐ **DRAFT INSTRUMENTS.** Indicating or recording types in single or multiple units. Furnished in all standard ranges of draft and pressure.

☐ **THERMOMETERS.** A long distance, gas filled thermometer with either single or multiple pen recorder.

☐ **LIQUID LEVEL INSTRUMENTS.** Remote reading indicators and recorders. Also provided with various types of alarm devices.

☐ **MULTI-POINT INDICATORS.** Will indicate, on separate vertical scales from two to sixteen units of draft, pressure, flow, temperature, CO_2, etc., in any combination desired.

☐ **MULTIPLE RECORDERS.** Strip Chart Type will record from three to six separate records of flow, temperature, CO_2, pressure, etc., in any combination desired. Round Chart Type can have up to 4 pens.

☐ **REGULATORS.** For the automatic control of pressure, draft, rate of flow, rate of fuel feed, speed of rotation, liquid level, etc. For proportioning two pressures or flows. Regulators may be either air or oil operated. Flexibility in design and construction allows the regulator to perform any type of control action. Setting may be remote or manual.

☐ **AUXILIARY RELAYS.** Multiplying, dividing, adding, subtracting, maximum and minimum setting, ratio, ratio computing, sequential, splitter, squaring, square root extracting, and position indicating.

☐ **COMBUSTION CONTROLS.** A centralized, automatic system for controlling steam pressure, combustion, furnace pressure, excess pressure, boiler level, etc. Automatically regulates the fuel and air input to a boiler in measured proportions and in a fixed ratio for the entire load range. Adaptable to multi-fuel firing.

☐ **DESUPERHEATERS.** Atomizing type desuperheater uses a small quantity of high pressure steam to vaporize an automatically controlled amount of water in reducing steam temperature to the desired degree.

☐ **VALVES—REGULATING AND PRESSURE REDUCING.** Designed and built for all practicable ranges of pressures with either flanged or welded ends. Special body design sharply reduces erosion and noise. Cylinder operated valves available in sizes from 3 in. to 24 in. Hand operated valves in sizes from 1 in. to 8 in. Lever operated valves in sizes up to 16 in. Republic valves are built in accordance with A.S.A. Standards for all pressures up to 2500 psi. Diaphragm operated valves are available for pressures from 125 to 1500 psi and from 3 in. to 10 in. in size. Special purpose alloy steel butterfly valves in sizes 4 in. to 24 in. are also available.

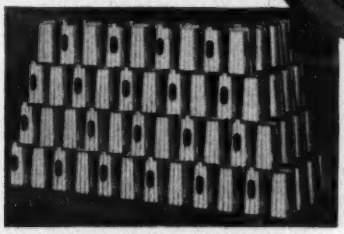
Data Books are available on any of the above equipment

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway • Chicago 47, Illinois

BRANCH OFFICES: Atlanta • Albuquerque • Boston • Buffalo • Cincinnati • Cleveland • Dallas • Denver • Detroit • Houston Indianapolis • Kansas City, Mo. • Los Angeles • Minneapolis • New Orleans • New York City • Philadelphia • Phoenix • Pittsburgh Richmond • St. Louis • Salt Lake City • San Francisco • Seattle • Syracuse • Shreveport • Tulsa • Vancouver, B. C.

This Monel tube bundle used in an HF Alkylation Unit Dehydrator Reboiler is an excellent example of the use of Monel to resist corrosive chemical attack even at high operating temperatures.



These plugs for 2-inch plug valves used in hydrofluoric acid alkylation service were machined from Monel rod. No. 140 Monel Arc Electrodes are used for overlaying steel plugs in larger valves.

How Monel muzzles HF ...even at high temperatures

Monel lined hydrofluoric acid regenerator column with 1/16" minimum lining of Monel. The two Monel grids are for holding the Raschig rings.

Anhydrous hydrogen fluoride and hydrofluoric acid are good and valuable servants. *But* they have to be controlled with a firm hand.

Allowed to have their own way, they'll chew right through most materials. Some materials resist the dry or highly concentrated acid but succumb to dilute solutions; other materials act in the reverse.

But it's a different story with Monel®!

Experience in hydrofluoric acid alkylation units has proven that Monel is usefully resistant to attack by aqueous HF in all concentrations at temperatures up to 250° F.—with anhydrous acid and steam-HF mixtures, Monel shows good resistance at temperatures as high as 1100° F.

Monel is comparatively insensitive to the effects of velocities which increase the corrosion rate of other materials. Therefore, it is suitable for valves, pumps and pipe lines, for impellers, stators and shafts, and for bubble caps and linings in hydrofluoric acid distillation columns.

It does not acquire a scale when exposed to anhydrous HF which makes it especially useful for moving parts having close clearances, such as plug valves and pump rings.

In addition to excellent chemical characteristics Monel provides its well-known physical properties . . . high strength . . . easy fabrication and welding.

Consult your Distributor of Inco Nickel Alloys for the latest information on their availability from warehouse and mill. Remember, too—it always helps to anticipate your requirements well in advance.

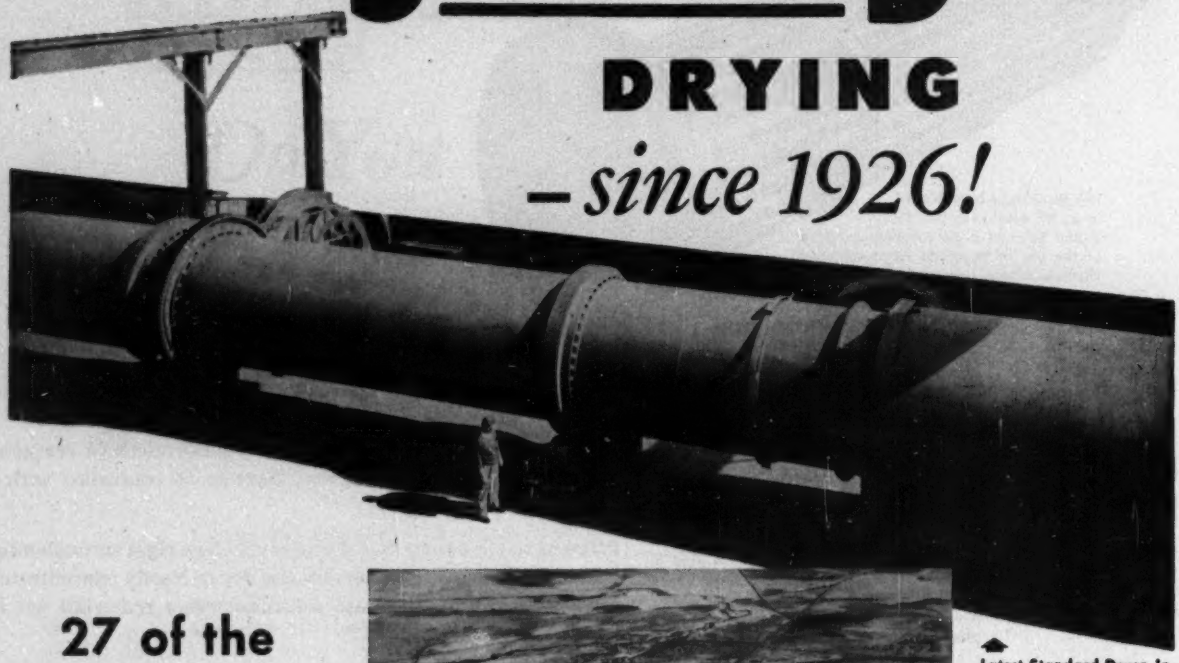
And if you have a special metal selection problem, Inco's Corrosion Engineering Section will be glad to help. Write them today. Write also for your free copy of "Corrosion by Hydrofluoric Acid," reprinted from The Oil and Gas Journal.

INCO TRADE MARK

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

MONEL . . . for minimum maintenance

STANDARD-IZED DRYING *– since 1926!*



Latest Standard Dryer, installed at West End Aug. 1952.

Air view of West End Chemical Company buildings. Annual production capacity is 200,000 tons of soda products & borates.

27 of the 28 Dryers used by WEST END CHEMICAL COMPANY are STANDARD-HERSEY

To tap the fabulous sub-strata chemical resources of Searles Lake in California's Mojave desert, it was necessary for the West End Chemical Company in 1926 to bring in special custom-made machinery and set up a plant at the source of the raw product. The machinery had to be rugged and dependable because repairs and replacement facilities were many long desert miles away.

Vital to the West End process of manufacturing borates and soda products is the use of rotary dryers. Their first dryer in 1926 was a STANDARD-HERSEY. With modifications, that dryer is still in use today. Since then, West End has purchased 26 additional STANDARD-HERSEY rotary dryers.

This case history is convincing proof of the dependability of STANDARD-HERSEY Dryers. Now celebrating its 50th year, *Standard Steel Corporation* manufactures more than 30 separate types of dryers for process industries throughout the world. Special equipment can be engineered to fill special drying requirements.

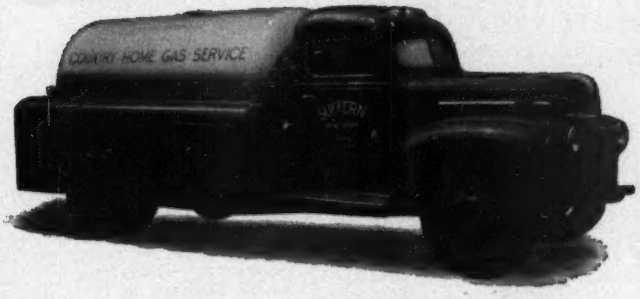
Standard-Hersey "pilot" drying facilities, utilizing our test plants, are available to both customers and prospective customers. WRITE *TODAY* FOR COMPLETE DRYER BULLETIN NO. 524.

STANDARD HERSEY *Dryers*

STANDARD STEEL CORPORATION
5005 Boyle Ave., Los Angeles 58 ★ 419-5 Commonwealth Ave., Boston 15

STANDARD 1902 50 YEARS 1952

even Standard TRUCK TANKS



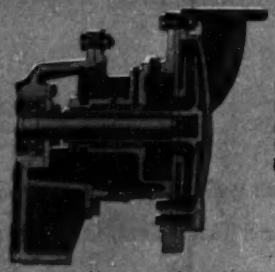
a.c.f.

- **STORAGE TANKS**
- **TANK CARS**

● Not as well known as their Storage Tanks and Tank Cars, a.c.f. makes many Truck Tanks in standard sizes, plus Truck Tanks up to maximum sizes (with respect to highway statutes) for mounting on truck chassis.

In building both Storage and Truck Tanks, a.c.f. brings to bear the same long and specialized experience which has made it a principal producer of Tank Cars in which liquid propane and other petroleum products are delivered over America's Railroads.

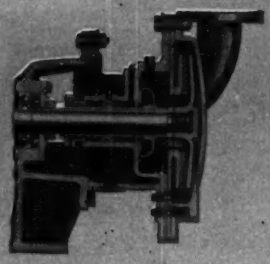
AMERICAN CAR AND FOUNDRY COMPANY • 30 CHURCH STREET, NEW YORK 8, NEW YORK
OTHER SALES OFFICES: CHICAGO · ST. LOUIS · CLEVELAND · PHILADELPHIA · WASHINGTON · SAN FRANCISCO



Standard Stuffing Box — for suction lift. Stuffing box on the suction side limits pressure on packing to suction pressure. Under suction lift conditions, the liquid being pumped does not enter the stuffing box.

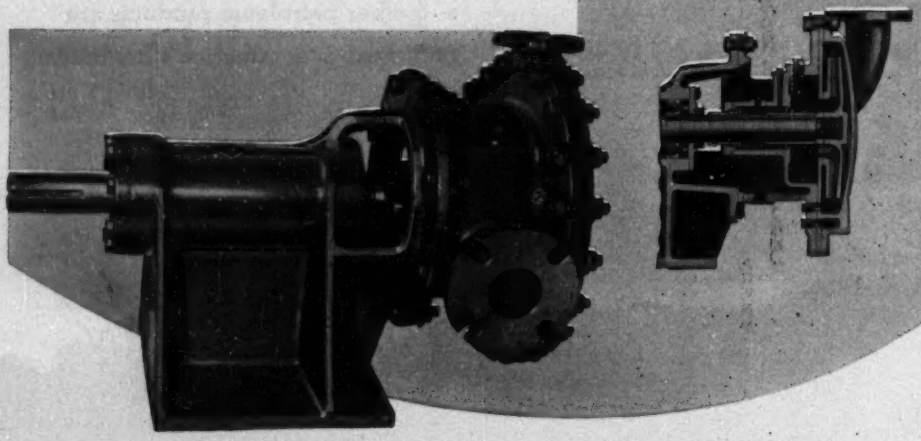
PROCESS PUMPS

VERSATILITY that Cuts Your Pumping Costs



***Equiseal* Stuffing Box — for suction heads to 15 feet.** The *Equiseal* stuffing box is equipped with an auxiliary impeller which produces a low pressure area in front of the packing. This low pressure area prevents the liquid being pumped from entering the packing on suction heads up to 15 feet at 1750 rpm.

Mechanical Seal — for suction heads over 15 feet. The Allis-Chalmers Process Pump may be fitted with a variety of mechanical seals for conditions where the suction head exceeds 15 feet. Each application is individually engineered.



YOU CAN HANDLE A WIDE RANGE of products with one type of pump when it is an Allis-Chalmers Type P Process Pump. Each of the three sealing methods shown here is interchangeable on any Type P pump with a minimum of alteration to the pump itself. No new major parts or permanent alterations are required to use any of these sealing methods.

CHOICE OF MATERIALS

The Allis-Chalmers Process Pump is available in a wide choice of materials to handle many combinations of abrasiveness and corrosiveness in the liquid to be pumped. Usual materials include aluminum bronze, *Ni-Resist*, 316 stainless steel, and 18% chrome steel, plus almost any special material which may be required, including non-machinable alloys. Parts subject to varying rates of wear are separated for easy replacement.

GET DETAILS

For complete details on the Allis-Chalmers Process Pump plus competent engineering assistance, call your nearby Allis-Chalmers District Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 52B6615. A-3902

Equiseal is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

U.S.I. CHEMICAL NEWS

★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★

Develop Super-Stable Foam To Fight All Liquid Fires

A new all-purpose air foam, claimed to have an effective life almost 50 times greater than other stable foams, is now being marketed for use in extinguishing all types of flammable liquid fires. It is explained that while half the water drains from what is considered a good foam in 10 minutes, the half-way drainage time for the new product is 12 hours.

Described as a protein-base material which is used in a concentration of six parts compound to 94 parts water, the foam is said to be effective against fires of alcohol and other water soluble solvents as well as against gasoline, benzene, and oil fires. The product contains special ingredients to make the foam stable to alcohol, so that the bubbles formed are immune to the action of water soluble solvents which destroy ordinary foam as soon as it is laid on a fire. By contrast, blankets of the new foam can cover an extinguished fire for hours and thus prevent its re-ignition, it is said. The foam is also claimed to have excellent adhesion and to cling well to even hot, vertical surfaces.

New Extraction Method Yields Purer Fats, Oils

A new process, invented in England, is claimed to accomplish the extraction of fats and oils without the use of heat and to yield purer products than are now obtained by present methods. The process involves subjecting the animal or vegetable raw material to mechanical impulses which are passed through cold water. It is said to extract the fat without any of the unpleasant smell and discoloration inherent in older methods of using heat or hot solvents. The new process is also quick, and costs are said to be greatly reduced.

Commercially, the method has only been used so far to extract fat from bones. However, it has been used experimentally to obtain a herring oil so pure it could be used for edible purposes, and it is also adaptable to on-the-spot extraction of vegetable oils at the plantation. The proportion of oils extracted by the process is said to be much higher, and in the case of edible products, the vitamin content is doubled because no heat is required.

Soft X-Rays Hard on Molds

So-called soft X-rays were recently proposed as a new and relatively inexpensive means for preserving drugs and all types of food products. Research has shown that these radiations, produced at comparatively low voltages, are able to penetrate foodstuffs and kill molds, viruses, and other spoilage-causing microorganisms. It does not matter if the packaging is of paper, fiber, plastic, foil, glass, or metal, and the X-ray treatment does not require pre-heating or cooling. Thus vitamins and flavor of heat-sensitive foods are retained, and frozen materials can be completely sterilized without melting, it is said.

Metallic Sodium Produced by National Distillers Chemical Now Marketed by U.S.I.

Both Organizations are Divisions of National Distillers Products Corp.; Research Program Aims at Broadening Applications for Sodium

In June 1950, a huge battery of electrolytic cells, designed to deliver 100,000 pounds of sodium metal daily, was put into operation at the new National Distillers Chemical Co. plant in Ashtabula, Ohio. Since that date, production has increased each year, as National helps to supply the growing demands for sodium metal in the manufacture of tetraethyl lead, fatty alcohols, indigo and other synthetic dyes, sodium peroxide, pharmaceuticals, alkoxides, insecticides, and many other chemicals; as well as for industrial applications such as sodium-cooled valves and the descaling of steels.

Until September 1952, the manufacturing plant at Ashtabula handled all sales of metallic sodium. The growth of the operation dictated an expansion of sales and sales development activities, however, and responsibility for these operations was turned over to U.S.I., another division of National Distillers Products Corporation. Today, from its Chemical Sales Department in New York, and from all of its 18 offices across the country, U.S.I. offers metallic sodium in 1, 2½, 5 and 12 pound bricks in 55 gallon steel barrels; in 1 and 2 pound bricks in 3½ gallon steel pails; and in tank cars containing 80,000 pounds net.

MORE

Find Antibiotics Increase Absorption of Minerals

The apparent ability of antibiotics to enhance the absorption of mineral elements has been advanced as one of the possible explanations for their growth promoting effects in animals. Experimental evidence cited in support of this theory includes the findings that certain antibiotics, when fed to animals, improve absorption of calcium, increase bone calcification, decrease requirements for manganese, and improve utilization of calcium and phosphorus. Evidence has also been obtained which indicates that procaine penicillin decreases the pH of intestinal contents. This effect is said to undoubtedly favor an increase in absorption of relatively insoluble minerals, such as calcium, phosphorus, and manganese, by increasing their solubility.

The main cell room of National Distillers' new sodium plant contains 94 Downs cells in which sodium and chlorine are separated from fused sodium chloride by electrolysis. Electrically heated containers, left, keep the sodium molten while awaiting transfer to filters.

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

U.S.I. CHEMICAL NEWS

CONTINUED

Metallic Sodium

Sodium in Two New Forms

Research teams at National's Cincinnati laboratories have developed two innovations in sodium chemistry which are proving invaluable to industry—sodium dispersions in hydrocarbon solvents and on inert solid carriers. Stable dispersions in inert hydrocarbon solvents may contain up to 50 per cent by weight of sodium metal. Particle sizes range from 10 to 20 microns in diameter, giving a tremendous increase in surface area of sodium available for reaction. This in turn makes possible increased reaction rates, lower reaction temperatures and pressures, increased yields, and decreased side reactions.

Improved Reaction Control

As would be expected, sodium particles in such dispersions are usually completely consumed before reactivity can be slowed by a surface coating of end products. This uniform reactivity results in improved reaction control and permits commercial utilization of many reactions, such as phenyl sodium, formerly limited to the laboratory. In Claisen condensations, the reaction time can be cut to about one-tenth, and there is an accompanying decrease in side reactions and a marked increase in yield. Many direct metalations are possible, by-passing the necessity of using alkoxides, sodium hydride, etc., thereby reducing raw material costs as well as reaction time. These are but a few of the growing fields of applications for sodium.

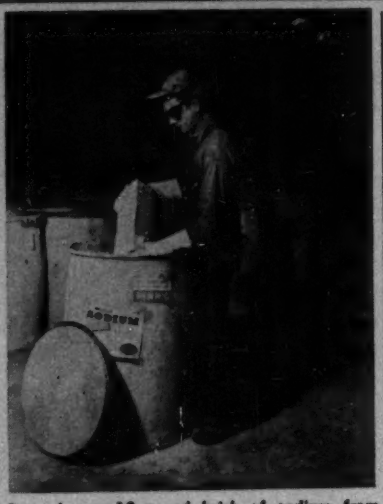
High Surface Sodium

Of more recent development, the second type of sodium dispersions—"High Surface Sodium"—consists of thin films of sodium over inert solid materials which present very large surface areas and make the metal available in substantially colloidal form. Depending on the carrier, 2 to 25 per cent of sodium can be adsorbed and handled as a free-flowing solid in fluidized and other moving solid systems.

High Surface Sodium offers all the advantages of sodium dispersions PLUS making sodium available for reaction in such a finely divided form that the colloidal particles approach the atomic diameter of sodium. Also it is readily adaptable to continuous operations at temperatures both above and below the melting point of sodium. Since the carriers are solids, e.g., salt, soda ash, carbon, and alumina, dry-way reactions are technically feasible and the hydrocarbon dispersing media used in preparing liquid dispersions are not required.

High Surface Sodium shows promise for purifying hydrocarbons such as in complete removal of sulfur from petroleum fractions, in the preparation of inorganic derivatives such as sodium hydride and sodamide, and in producing finely divided metals such as colloidal nickel and platinum for use as catalysts.

Technical bulletins on metallic sodium, sodium dispersions, High Surface Sodium, and sodium handling, as well as full information on shipments and prices, may be obtained by writing to U.S.I. at 120 Broadway, New York 5, N. Y., or to any of its branch offices.



Removing a 12-pound brick of sodium from a steel shipping barrel. Bricks are also available in 5, 2½, and 1-pound sizes.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U. S. I.

To completely stop all rust inside fuel tanks, a cartridge of a new material dropped in once a year is all that is required, it is claimed. Compound is said to neutralize corrosion acids and deposit a protective film inside tank. **(No. 881)**

A hard-to-find 3-carbon molecule and a highly reactive aldehyde group is now available in a single compound for large-scale chemical syntheses. New intermediate is propionaldehyde, offered in tank car quantities in 95% minimum purity. **(No. 882)**

A new sound deadener for light metal equipment has a fluid consistency, can be applied by spray or with a wipe-on tool, dries rapidly, remains in place indefinitely, and stands baking as high as 325° F., the manufacturer states. **(No. 883)**

A combination fire retardant, water repellent, and fungicidal treatment for wood is recommended by the manufacturer for shingles, fences, furniture, etc. Material does not cause swelling, shrinking, or warping, it is said. **(No. 884)**

To keep leftover paints, enamels, and varnishes fresh and smooth for long periods of time, an oxidation inhibitor is available in liquid form which is claimed to eliminate necessity of straining or removing unusable skin. **(No. 885)**

Home owners can remove brown stains caused by copper screens on the outside of the house with a new product said to be harmless to outside paint. **(No. 886)**

A new ionic paint spray gun charges paint electrically before it leaves the gun so that it differentiates between painted and unpainted surfaces, gives an even finish, and penetrates into all cavities and crevices, according to the manufacturer. **(No. 887)**

True hiding power of paint can be reliably determined in 3 to 5 minutes, it is claimed, with a new instrument which gives the thickness of the paint in mils and the coverage in square feet at this thickness, as well as its most efficient hiding power. **(No. 888)**

A new rigid thermoplastic sheet stock is reported to be well suited to production of large area parts at high speed with low-cost heat forming and drawing methods, and to have a satin-like surface finish. **(No. 889)**

To evaluate an ink film's scuff or rub resistance on paper or paperboard, a new measuring device is available which controls and reproduces pressure, speed, and number of rubs. **(No. 890)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)

Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous

ANTI-FREEZE
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze

ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.

ACETONE—A.C.S.

ANSOLS
Ansol* M
Ansol* PR

ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate

RESINS (Synthetic and Natural)
Arochem*—modified types
Aroplaz*—alkyds and allied materials
Aropol†—copolymer modified alkyds
Ester Gums—all types
Natural Resins—all standard grades

INSECTICIDE MATERIALS
Allethrin
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid and Dust
Rotenone Products: Liquid and Dust

INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents

Arochem*—modified types
Arodure*—urea-formaldehyde resins
Arofene*—pure phenolics
Aroflat*—for special flat finishes
Aroflint*—room temperature curing phenolic
Aroplaz*—alkyds and allied materials
Aropol†—copolymer modified alkyds
Ester Gums—all types
Natural Resins—all standard grades

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloranilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

FEED PRODUCTS
Calcium Pantothenate (Feed Grade)
Curbay B-G*
DL-Methionine (Feed Grade)
Niacin, U.S.P.
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
Vacutone* 40

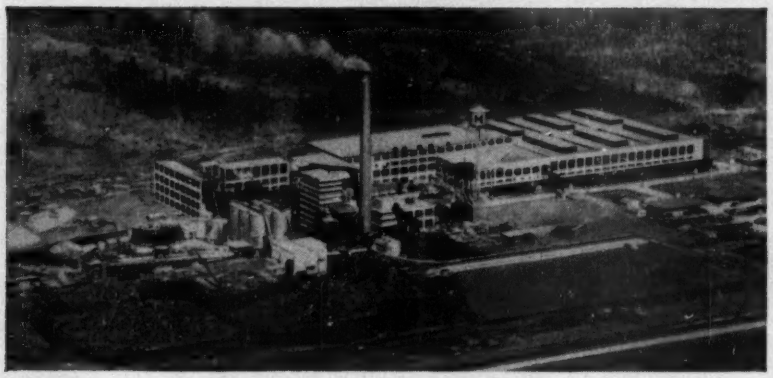
OTHER PRODUCTS
Acetaldehyde
Ethylene
IPC (Isopropyl-N-Phenyl Carbamate)
CIPC (Chloro-IPC)
Methionine (Pharm.)
Nitrocellulose Solns.
Propionaldehyde
Propionic Acid
Sodium Metal
Urethan, U.S.P.

*Reg. U.S. Pat. Off.
†Trademark Pending

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers Products Corporation

120 BROADWAY, NEW YORK 5, N. Y. BRANCHES IN ALL PRINCIPAL CITIES

HUDSON MULTIWALL SACKS ARE NOW THE INDUSTRY'S MOST FULLY GUARANTEED



This huge new ultra-modern Hudson mill at Palatka, Florida can make firm promises because it is independent of outside suppliers who may cause delays. Here, every step in the manufacture of Hudson Multiwall Sacks, from tree to the finished product, is under Hudson's exclusive ownership.

INTEGRATED OPERATION BACKS UP HUDSON GUARANTEE

PALATKA, FLA. Hudson is the only Multiwall Sack manufacturer to guarantee its sacks against breakage on the filling or closing machines. The company has enough faith in its product to agree to replace without cost all Hudson Multiwall Sacks that fail on the purchaser's packing or closing machines.

Hudson's fully integrated operation provides the control of quality that such an unusual guarantee demands. Variations from outside suppliers are eliminated. To assure a dependable source of pulp Hudson owns and maintains 435,000 acres of choice timber. The strong, long-fibered Kraft is manufactured with laboratory controlled uniformity. The finished sacks (pasted, sewn, valve, or open mouth) are tailored to your most exacting specifications. And assured delivery is available by rail, truck, or water.

HOW HUDSON'S NEW GUARANTEE WORKS

When Hudson Multiwall Sacks are delivered into your custody, the company's new guarantee goes into full force.

All Hudson Multiwall Sacks must successfully pass your packing machines or be replaced without cost.

All Hudson Multiwall Sacks must pass your closing operations without failure, or Hudson will replace them.

Replaces Multiwall Sacks broken on your packer

NEW YORK CITY. "Our new guarantee to replace without cost every sack broken in packing and closing on your machines," stated T. H. Mittendorf, Hudson's Vice-President in Charge of Sales, "makes our Multiwall Sacks the most fully guaranteed in the industry. This is a big advantage to buyers because now they can count on using every sack they purchase."

T. H. Mittendorf

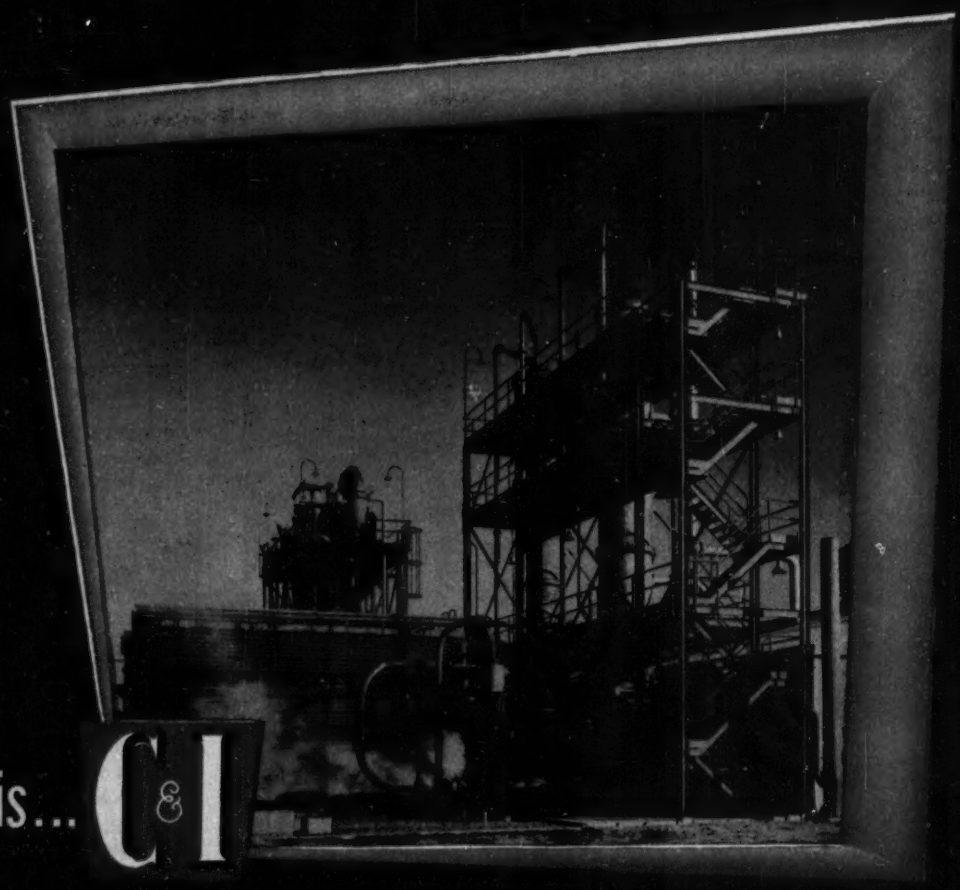
Mr. Mittendorf further explained, "Until Hudson introduced this new replacement policy, every user had to pay for his own losses for normal breakage on the packing or closing machines. But Hudson's new guarantee has changed all that. Now, when you use Hudson Multiwall Sacks, your original cost for sacks is your final cost!"

Urge Multiwall Sack users to write for facts

The Hudson Pulp & Paper Corp. invites all users of Multiwall Sacks to learn how they can benefit by using guaranteed Hudson Sacks. Examine [illegible] see this [illegible]. [illegible], and [illegible] are promised!

Send for full details!
Tell me, without obligation, about the many advantages of your new Multiwall guarantee.
NAME
COMPANY
STREET
ZONE STATE
CITY

Hudson Pulp & Paper Corp.
Dept. 133, 505 Park Ave., New York 22, N.Y.



why is... C&I the number one builder of nitric acid plants?

In recent years, over 90% of the nitric acid plants built in the U. S. have been built by C & I.

Why? . . because C & I engineering, design, and construction know-how plus vast experience delivers your nitric plant at a FIXED COST . . on a FIXED DATE. Size of nitric acid plants range from 10 to 200 tons per day.

C & I is also prepared to build Neutralizer, Ammonium Nitrate and Complex Fertilizer plants. Your inquiries are invited.

C&I

THE CHEMICAL & INDUSTRIAL CORP.

CINCINNATI 26, OHIO

Specialists in the Processing of Sulphurous Gases

"Buffalo" *Tips on Making Your Fans Last*

RUBBER LINING GIVES FUME FANS A NEW LEASE ON LIFE!

Rubber "welded" to all interior parts of these "Buffalo" Exhausters increases their life 3 to 12 times in handling severely corrosive fumes! All welded strength, accessible construction, high efficiency have made this a popular fume fan in the chemical industries for many years.

Other Tips on Lengthening Fan Life

First, when ordering a fan, specify exactly what it is to handle. Your supplier can then recommend the correct construction material or protective coating. *After* installation, a regular program of inspection, cleaning and repainting will pay off in extra years of service. And, for further information on getting the most out of your fan investment, write:

WRITE TODAY!
For further helpful information on fume handling, write for Engineering Bulletin 2424-E.

75 YEARS

"Buffalo" FIRST FOR FANS

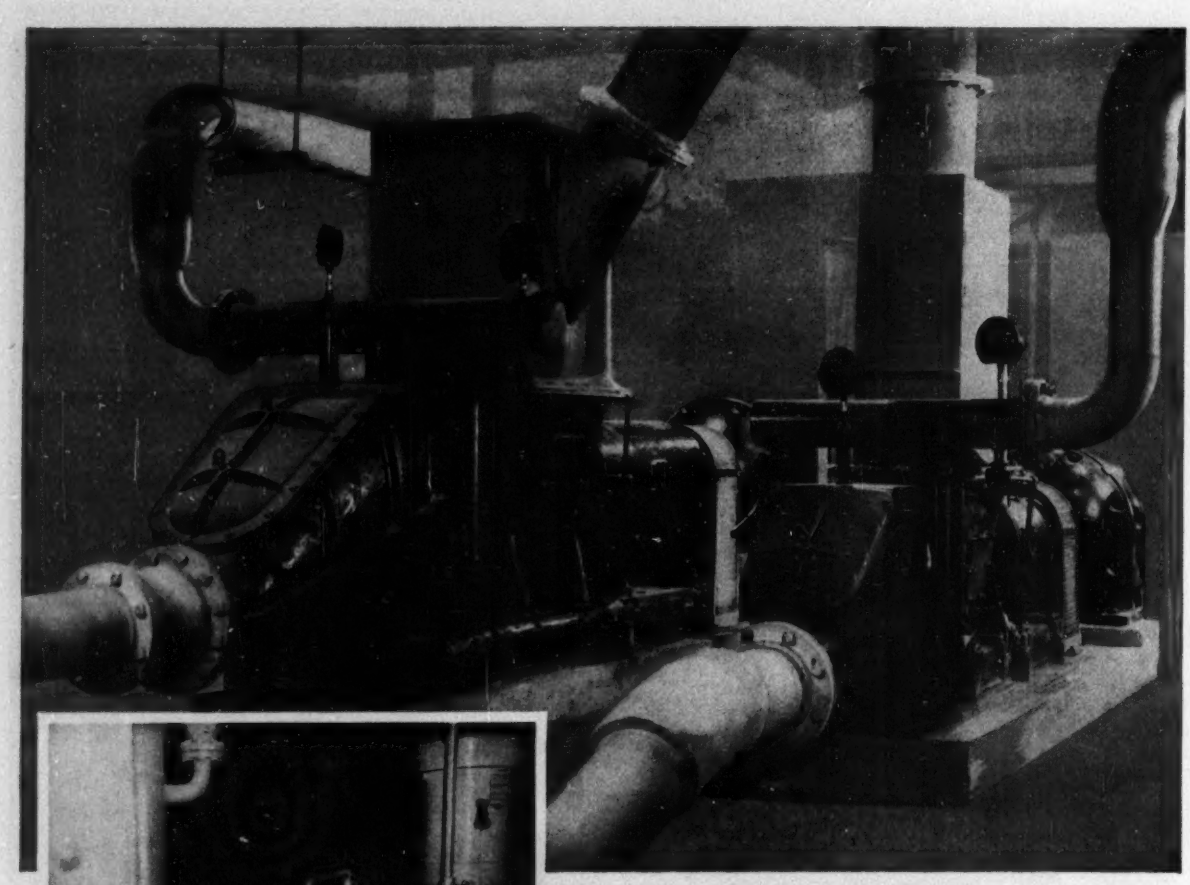
BUFFALO FORGE COMPANY

501 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING | PRESSURE BLOWING | AIR CLEANING | COOLING | AIR TEMPERING | HEATING | INDUCED DRAFT | FORCED DRAFT | EXHAUSTING



Top photo: Two Fuller-Kinyon Pumps installed in a cement plant. One conveys 80 tons of raw materials and the other 360 barrels of finished cement an hour. Lower photo: Fuller Rotary Single-stage Compressor furnishing air for the raw material pump, capacity 1044 c.f.m., 26-lb. pressure.

A combination that's hard to beat . . .

FULLER-KINYON PUMPS and FULLER ROTARY COMPRESSORS

FULLER-KINYON: The system that is recognized as the outstanding means for conveying many types of dry, pulverized materials from processing equipment to storage bins and silos; from storage to packer bins, process, cars, ships, and barges. Also used for unloading from cars, ships, and barges. For certain requirements the system can be remote or automatically controlled. It meets every demand placed upon it—full capacity can be economically maintained up to the maximum conveying distance. Safe, clean, efficient conveying.

FULLER ROTARY COMPRESSOR: This compressor delivers a uniform flow of air, without pulsations, discharging the air directly into the Fuller-Kinyon Pump, without unloaders or air receivers. Connected thus, the power input conforms automatically to the work-load (back pressure) of the conveying system. Air—where and when needed to do the work in an efficient and economical manner.

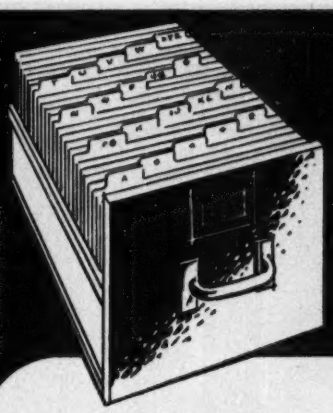
Why not take advantage of Fuller's 26 years of experience in the field of conveying the next time you have a conveying problem? We'll be glad to work with you and give you the benefit of this experience.

FULLER COMPANY, Catasauqua, Pennsylvania
Chicago 3—120 So. LaSalle St.
San Francisco 4—420 Chancery Bldg.

Fuller

26 YEARS' EXPERIENCE IN PNEUMATIC CONVEYING
PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS

P-140



Yours for the asking...

up-to-the-minute technical data on

CAST STAINLESS STEEL VALVES • FITTINGS • CASTINGS

1. STANDARD PRACTICE SP-42 . . . Eight page folder listing detailed specifications for 150# corrosion resistant cast flanged valves, flanges and flanged fittings.

2. VALVE COMPARISON CHARTS . . . Four page charts comparing design features of leading competitive 2" and ¾" stainless steel gate valves.

3. FLOW DIAGRAMS . . . Four page folder describing basic stainless steel valve designs in terms of fluid flow. Uses and limitations of each major type are discussed.

4. MATERIALS SELECTION CHART . . . Four page chart designed to assist in the selection of the most economical alloy for a given corrosive problem. More than 350 specific corrosives are included.

5. ALLOY REFERENCE CHART . . . Six page pamphlet listing alloy designations, applications, properties and analysis of corrosion and heat resisting alloys.

6. HOW TO GET THE RIGHT VALVE . . . Eight page folder giving information needed to enable manufacturer, supply company or sales representative to fit the proper valve for the application. Tells user or buyer how to get what he needs when ordering a valve.

7. CAST STAINLESS STEEL IN THE PAPER INDUSTRY . . . Eight page folder describing how stainless steel castings, valves and fittings are used to beat corrosion in the paper industry

8. THREADING STAINLESS STEEL . . . Four page folder describing specific high production machining operations on stainless steel valve parts. Speeds, cutting angles, coolants and tooling are discussed.

9. HIGH TEMPERATURE CHARACTERISTICS . . . Technical data chart giving high temperature characteristics of heat resistant alloys.

10. PROPERTIES OF CAST STAINLESS ALLOYS . . . Technical data chart giving designations, composition, mechanical and physical properties of cast stainless alloys.

11. MOLYBDENUM BEARING STAINLESS CASTINGS . . . Four page folder discussing the properties and applications of molybdenum bearing cast stainless alloys.

12. USES FOR CAST MONEL . . . Eight page booklet describing properties and applications of cast monel.

13. WHAT TYPE HIGH ALLOY CASTINGS . . . Four page folder describing selection of alloy types in keeping with government regulations.

14. QUIKUPL STAINLESS STEEL FITTING . . . Technical manual describing design, applications and limitations of revolutionary new type stainless fittings.

15. CATALOG #52 . . . Forty-eight page catalog describing complete line of Cooper Alloy stainless steel valves, fittings and accessories. Includes engineering drawings, weights, dimensions, size ranges, plus valuable material and corrosion data.

16. VALVE TOPICS . . . Technical periodical published bi-monthly for users of stainless steel valves and fittings.

17. NEWSCAST . . . Technical periodical published bi-monthly for users of stainless steel castings.

18. TECHNICAL TOPICS—GENERAL . . . Seven concise technical discussions covering corrosion, magnetism, machining, welding and pickling of stainless alloys.

CLIP THIS COUPON

1	7	13
2	8	14
3	9	15
4	10	16
5	11	17
6	12	18

THE **COOPER ALLOY** FOUNDRY CO. • HILLSIDE, NEW JERSEY

LEADING PRODUCERS OF **STAINLESS STEEL** VALVES FITTINGS AND CASTINGS

Check for FREE LITERATURE

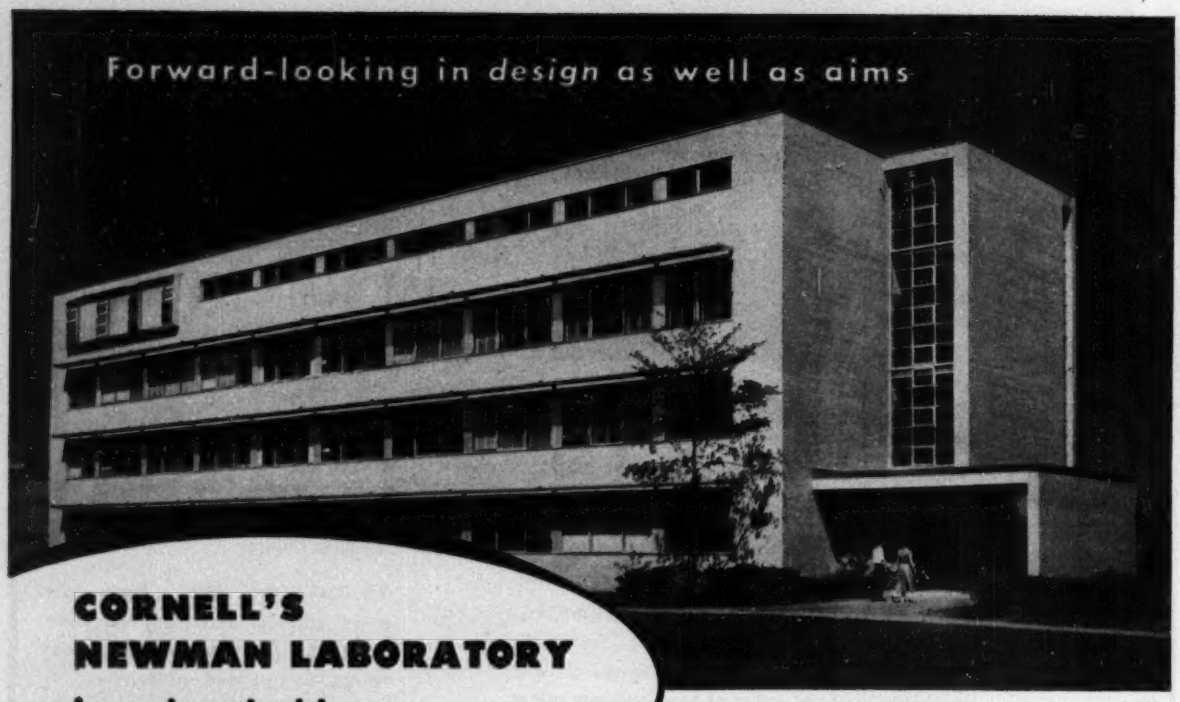
Name_____

Position_____

Company_____

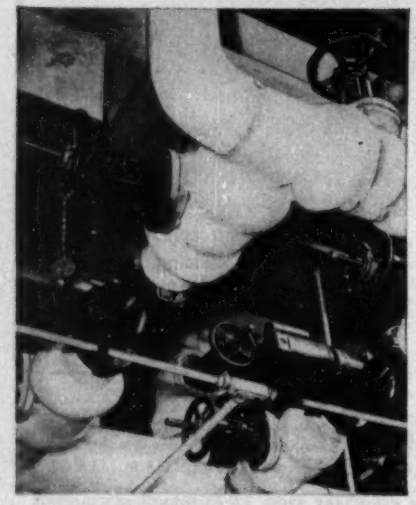
Address_____

City_____ Zone_____ State_____



CORNELL'S NEWMAN LABORATORY is equipped with JENKINS VALVES

Architects: SKIDMORE, OWINGS AND MERRILL
Consulting Engineer: GUY B. PANERO
General Contractor: BARR AND BARR
Plumbing Contractor: H. J. BAREHAM AND SONS



As carefully planned as the Laboratory's program of basic research was its physical plant and equipment. Here are some of the many Jenkins Valves which serve the main laboratory (30,000 sq. ft. of working floor area) and adjoining synchrotron building. Picture shows manifold for zone heating, with hot water circulation lines.

Far above Cayuga's waters stands a modern laboratory dedicated to a problem as old as physics—investigating the elementary particles of nature. In plant and equipment, the Floyd Newman Laboratory of Nuclear Studies at Cornell University is a physicist's dream come true.

There are 23 laboratories, including four for radio-chemical and bio-physical research, and also dark rooms, shops, offices, synchrotron control and detector rooms, and a roof laboratory for cosmic ray research. Both the main laboratory and the connecting building housing a 300-million-electron-volt synchrotron are constructed of reinforced concrete and are completely air conditioned.

The same future-minded planning governed the specification of *all* plant operating equipment. For vital service lines, such as power and steam, Jenkins Valves were selected. This confidence in the *extra measure* of efficiency and endurance provided by Jenkins Valves is shared by the nation's leading architects, engineers and contractors.

Despite this extra value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17.

JENKINS VALVES

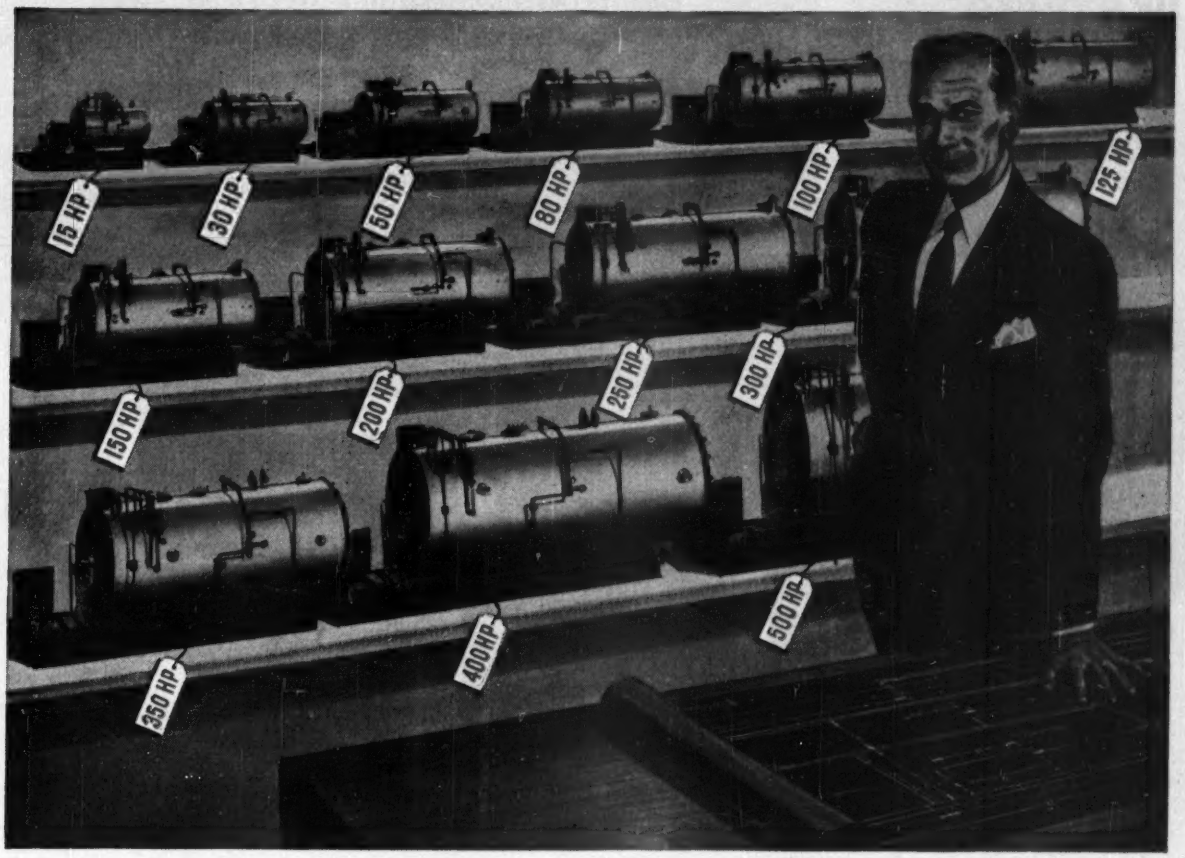
LOOK FOR THE DIAMOND MARK

SINCE 1864 JENKINS MARK

Jenkins Bros.

Sold through leading Industrial Distributors everywhere

Selecting The Right Boiler Is Most Important...

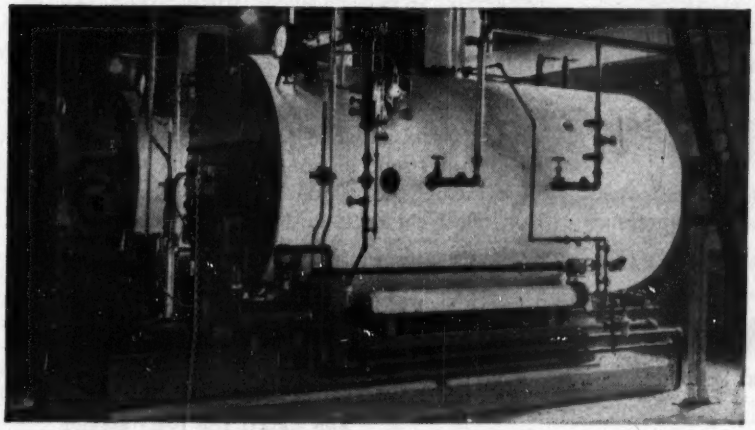


Cleaver-Brooks does not sell steam boilers "off the shelf" even though the boilers are available in standard models. Working with you, your engineers, and your consulting engineers Cleaver-Brooks helps analyze your particular steam needs and loads, both present and future.

These are a few of many factors considered: steam requirements in pounds per hour or b.h.p. — constant or fluctuating loads — fuels available — electric current characteristics — space and boiler room layout — provision for expansion.

Application engineering assistance of this kind assures you a steam plant tailored for your job. Cleaver-Brooks are the first and finest in modern, self-contained steam boilers — operate at a guaranteed efficiency of 80% — burn the fuel most available and economical in your area, gas, oil, or combination gas and oil — fully meet all codes — standard models available in sizes 15 to 500 hp; 15 to 250 p.s.i.

Write for latest, fully illustrated and descriptive Cleaver-Brooks Steam Boiler catalog.



Cleaver-Brooks

STEAM BOILERS

CLEAVER-BROOKS COMPANY
Dept. D, 344 E. Keefe Ave., Milwaukee 12, Wis., U.S.A.
Cable Address: Clebro-Milwaukeewis

Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

H.P. pipe gaskets like these *made to your order* by gasket specialists...

...to save you both time and money

When you need metallic gaskets for high pressure piping, put the job up to Johns-Manville Goetze Gasket specialists. You benefit in many ways:

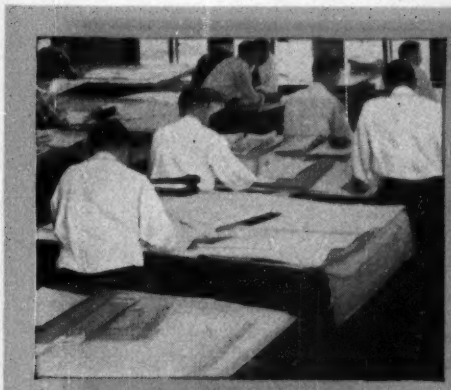
You get the exact gaskets you need for maximum efficiency under *your* operating conditions, tailor-made to fit *your* equipment. You get the savings in cost made possible by intensive specialization and modern production tooling. And you get the full benefit of over sixty years' experience in designing specialized metallic gaskets for industry's most complex sealing requirements.

Typical styles of Johns-Manville Goetze Gaskets that have been made to order for high pressure piping service are shown above. The flare type gasket with bellows action and the solid flare type are particularly suited for pressures above 5000 psi; the profile and V-Tite gaskets are generally used for lower pressures. Each of these is fabricated to extremely close tolerances. Other styles can be made to any desired cross section to meet your individual requirements.

For more information about Johns-Manville Goetze Gaskets, write for your copy of Catalog PK-35A. Or send us your drawing or template for an immediate quotation. Address: Johns-Manville, Box 60, New York 16, N. Y.

Johns-Manville *Goetze* GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE



AFTER YEARS OF WEAR AND TEAR

Drawings are reclaimed without costly retracing

A case history based on the Buflovak Equipment Div., Blaw-Knox Corp., Buffalo, N. Y.—leading manufacturer of chemical and food processing equipment.

When any one of the 80,000 odd drawings in the Buflovak files is incapable of producing the sharp, clean blueprints needed for use in the shop . . . there's no redrafting problem.

"New drawings" are made from old ones—quickly, inexpensively with Kodagraph Autopositive Paper.

This revolutionary photographic intermediate material intensifies weak line detail, drops out stains, creases . . . produces fast-printing duplicate originals with dense photographic black lines on a durable, evenly translucent white paper base.

And the job's done at low cost because "Autopositive" is unique—a photographic paper that can be handled in ordinary room light . . . that produces positive copies directly—without a negative step. Also, it can be exposed in standard print-making equipment . . . processed in standard photographic solutions. *Convenience, economy*—from start to finish. And it's the same story in subsequent print production: Autopositive intermediates print back at practical, uniform speeds . . . and produce sparkling prints even after hundreds of "run-throughs."

Additional drafting time is saved in reproducing the prints which accompany customer orders. Extra detail must often be added before shop prints can be produced. So instead of redrafting, Autopositive intermediates are made . . . and then the new design is added to these print-making "masters." (If blueprints are received, they are reproduced on Kodagraph Repro-Negative Paper, which produces positive intermediates *directly* . . . and which is exposed and processed in same manner as Autopositive.)

Extra protection for Buflovak's more complicated and expensive drawings is obtained by reproducing them on Kodagraph Autopositive Cloth. This direct-to-positive printing photographic material produces extremely durable intermediates, which will remain intact year after year.

Kodagraph Reproduction Materials

"THE BIG NEW PLUS" in engineering drawing reproduction

Learn how Kodagraph Autopositive Paper is simplifying operations in thousands of drafting rooms. Write today for a free copy of "New Short Cuts and Savings" . . . interesting facts about companies you know . . . and a revolutionary new product *you should know.*

MAIL COUPON FOR FREE BOOKLET

105

EASTMAN KODAK COMPANY
Industrial Photographic Division, Rochester 4, N. Y.

Gentlemen: Please send me a free copy of your new illustrated booklet, "New Short Cuts and Savings."

Name_____ Position_____

Company_____

Street_____

City_____ Zone____ State_____

Kodak
TRADE-MARK

A Century MOTOR With Gas Mask PROTECTION

Underwriters Approved EXPLOSION PROOF MOTORS

Take a look at these Century Explosion proof Motor features:

- Vital motor parts protected—sealed into inner frame.
- Motor can be reversed without changing direction of the fan—fan runs in either direction.
- Uniform ventilation surrounding outside of inner frame.
- Smooth, straight-through ventilating passages.
- Winding electrically insulated 6 different ways.
- Unusually free from vibration.
- Ball bearing housing keeps grease in—dirt out—lubricated for several years' normal service, with grease plugs for additional lubrication, if necessary.
- Easy-to-remove fan guard is held securely in place with two screws.
- Smooth exterior surface is easy to clean.
- Cast iron frame with integrally cast feet resists rust and corrosion—even when mounted in places where processed materials may contact the feet.
- Rugged construction gives generous safety factor for rough handling.

CE-760

Your property and employees are protected, because this Century Explosion Proof motor is totally enclosed—sealed to prevent a motor spark from causing an explosion.

Class I, groups C and D are used in atmospheres containing flammable gases or vapors: Ethyl ether vapors, gasoline, petroleum, napthha, alcohols, acetone, lacquer solvent vapors and natural gas.

Class II, groups E, F and G are used in atmospheres containing combustible dusts: Metal dust, carbon black, coal or coke dust and grain dusts.

Naturally, corrosive or abrasive materials in the air are also sealed out of the vital parts.

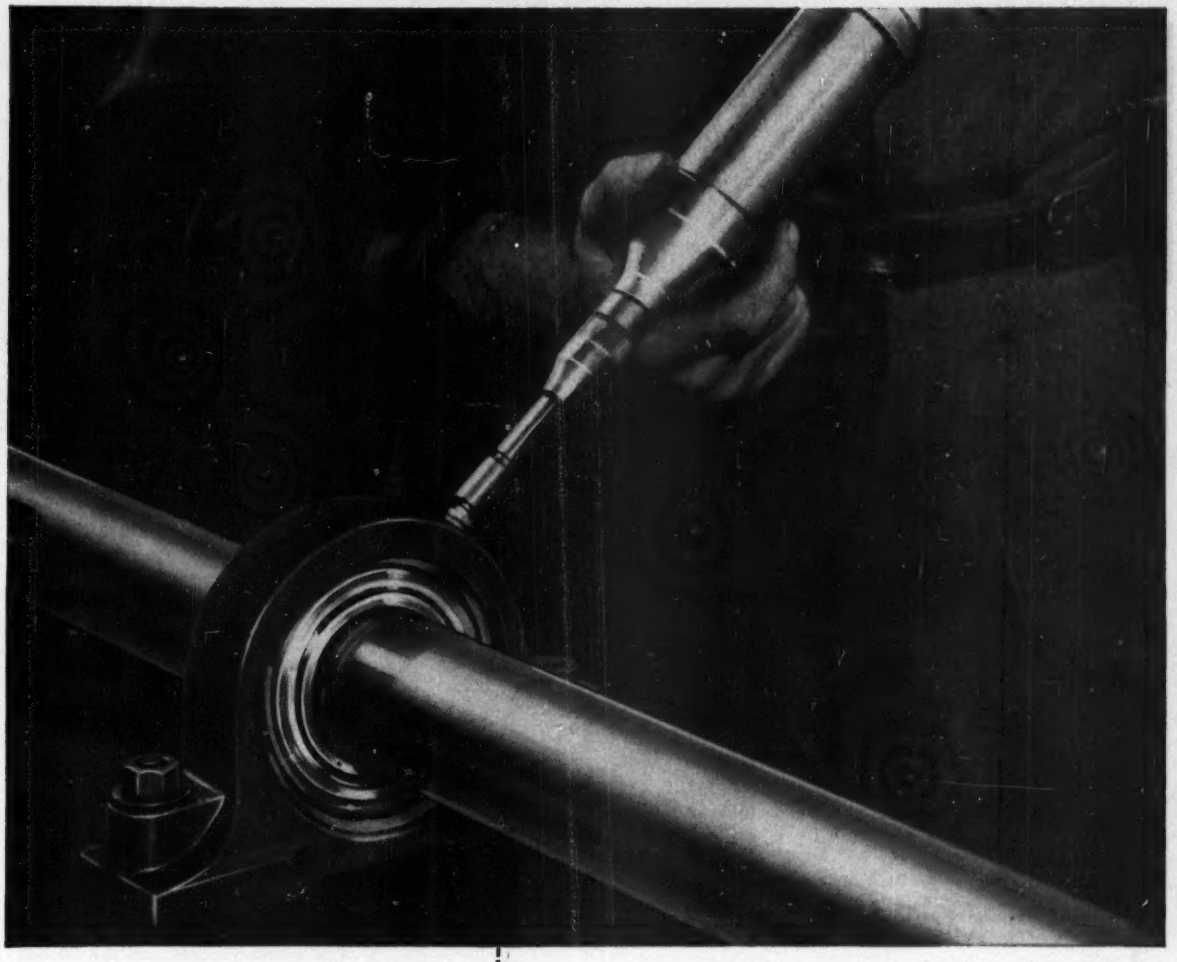
For your protection, specify Century motors on new equipment or for replacement. Your nearby Century Distributor will be glad to give you full information on the complete line of Century motors—from 1/8 to 400 horsepower. We are limited in some sizes of the Explosion Proof motor.

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

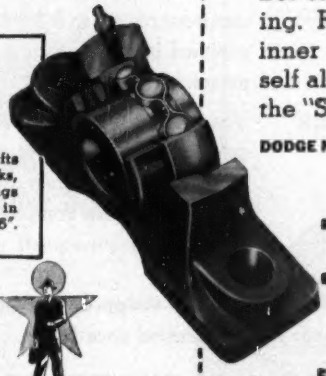
Offices and Stock Points in Principal Cities



NO, SIR!
The Seal Won't Blow!

DODGE TYPE "SC" BALL BEARING PILLOW BLOCK

Precision built bearing for small shafts and moderate loads. Pillow blocks, flange bearings and hanger bearings available from distributors' stocks in shaft sizes ranging from 3/4" to 2-7/16".



CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained, he can give you valuable assistance on new, cost saving methods. Look for his name under "Power Transmission Equipment" in your classified telephone book.

METALLIC-BACKED neoprene seals are used in this famous bearing—and they are engineered to *stay put.* They won't blow.

Your lubricant stays in; dust and dirt stay out; the result is years of trouble-free performance.

The "SC" Bearing is a service-proved member of the Dodge 30,000 hour line. Modern styling. Rugged one-piece cast-iron housing. Long inner race. Radial and thrust load capacity. Fully self aligning. *WRITE* for complete information on the "SC" Bearing in the Dodge catalog.

DODGE MANUFACTURING COPPORATION, 200 Union St., Mishawaka, Ind.

DODGE

of Mishawaka, Ind.

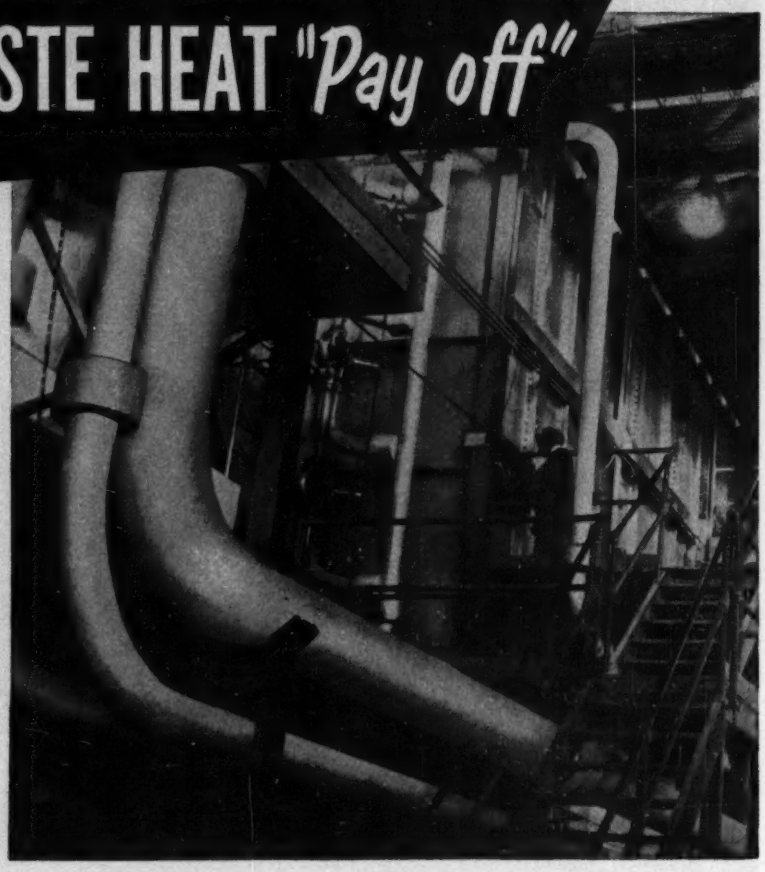
FIRST IN POWER TRANSMISSION MACHINERY

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

MAKING WASTE HEAT "Pay off"

with

the help of K&M insulations



One of the East's large cement companies gets all the electric power it needs for plant operation by utilizing the waste heat from its cement kilns. This heat is first directed to a boiler which produces a continuous supply of 700°F. steam. This, in turn, is piped to a power-generating turbine—and that's where K&M insulations come in!

So that heat loss is held to a minimum, two effective K&M insulations have been used in combination on the main steam header: a 1½" layer of "Featherweight" 85% Magnesia over a 1½" layer of Hy-Temp insulation. For two smaller boiler-feed water lines, a 1½" layer of "Featherweight" 85% Magnesia is sufficient. All pipes have been finished with a canvas jacket and painted.

K&M "Featherweight" 85% Magnesia is a versatile, dependable, economical insulation for applications up to 600°F. Combined with Hy-Temp, it is efficient on installations having temperatures up to 1900°F. Both materials are supplied in a wide variety of forms and thicknesses.

Your K&M distributor, an experienced applicator, will gladly answer your questions about these products and their uses. Call on him soon, or write to us for complete information.

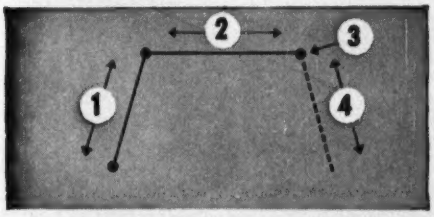
Nature made Asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

If You're Batch-Cooking You Can Use This Inexpensive Control

Here is a recorder-controller planned especially for economically controlling processes like batch cooking. The Gotham Elapsed Time Recorder-Controller does the essential control jobs easily and accurately. First of all, it brings the batch up to maximum holding temperature fast. It holds the batch at that temperature for a predetermined period. It shuts down the process at the end of the cooking period. Those are its three standard functions. Automatic venting or cooling functions can be added. Also available with a pressure, instead of temperature, system.

Write for full information about the Elapsed Time Recorder-Controller and other Gotham Controllers. They're in Catalog 500.



This Is What the Gotham Elapsed Time Recorder-Controller Does

1. Brings controlled variable (temperature or pressure) up to maximum fast.
2. Holds variable at maximum for predetermined period.
3. Shuts down process.
4. Automatic venting or cooling can be added.

Gotham Elapsed Time Recorder-Controller

SPECIFICATIONS

CHART SIZE: 12"

CASE: Standard - black crinkle; smooth black or white may be obtained.

ACTUATION: Vapor, Gas or Mercury for temperature. Pressure elements available.

CHART DRIVE: Spring wound or synchronous motor.

CONTROL SYSTEM: Pilot relay with adjustable sensitivity for 0 to 30% throttling band is standard, two position or 100% throttling band available.

HOLDING PERIOD: Standard 0 to 3 hrs. Other periods available.

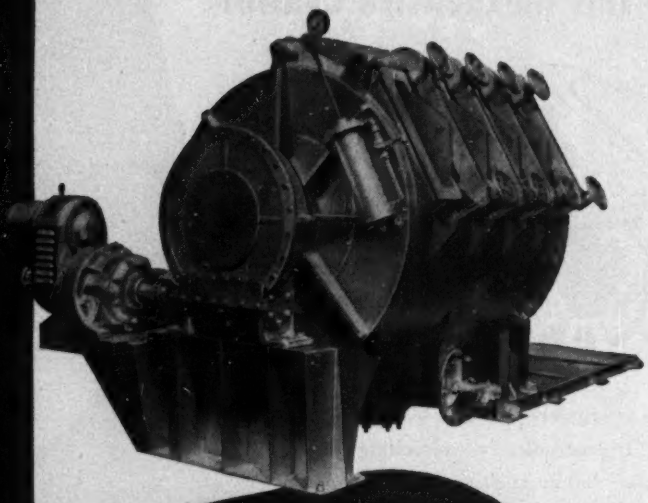
Keep Everything Under Control With Gotham

GOTHAM INSTRUMENTS

Division of AMERICAN MACHINE AND METALS, INC.
Dept. 9, 233 Broadway, New York 12, New York

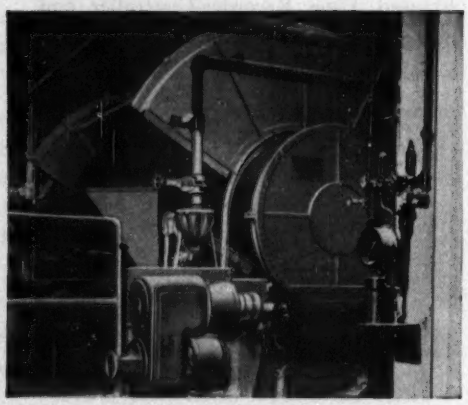
dependable process equipment built to fit your needs

Conkey Rotary Leaf Pressure Filters stay closed throughout operating cycle—you save on cloth and labor!



CONKEY FILTERS
FOR CHEMICALS

Conkey Rotary Disc Vacuum Filters clarify, wash solubles from solids and dewater.



Conkey Rotary Drum Vacuum Filter is a continuously operating filter for dewatering solids and washing solubles from accumulated solids.

PROCESS EQUIPMENT DIVISION
GENERAL AMERICAN

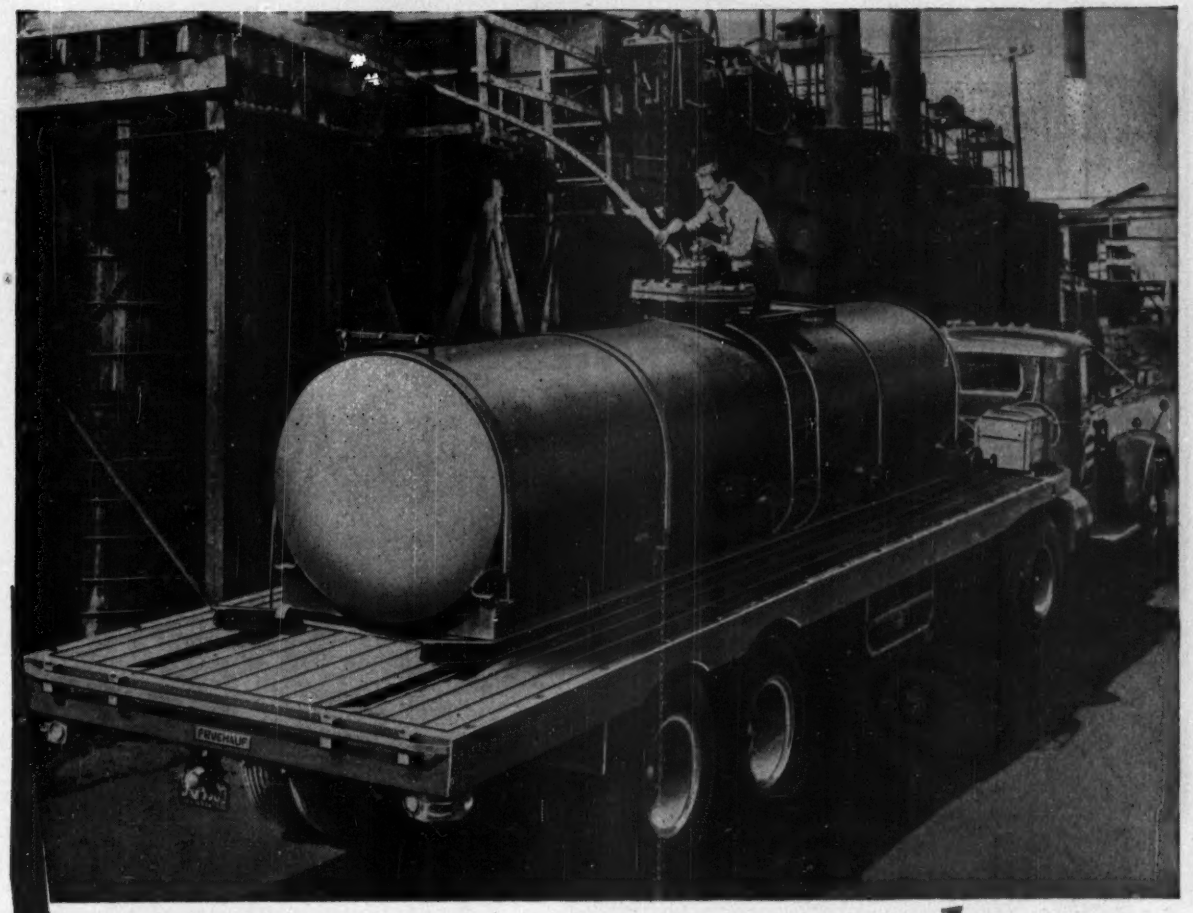
Process Equipment Division

Send for latest bulletin on Filters

GENERAL AMERICAN TRANSPORTATION CORPORATION

Sales Office: 10 East 49th Street, New York 17, New York
General Offices: 135 South La Salle Street, Chicago 90, Illinois
In Canada: Canadian Locomotive Company, Ltd., Kingston, Ontario
OFFICES IN ALL PRINCIPAL CITIES

Other General American Equipment: **Turbo-Mixers • Evaporators • Dewaterers Towers • Tanks • Bins • Dryers • Pressure Vessels**



Jacks of all Trades and Masters of all...

FRUEHAUF Trailers
"ENGINEERED TRANSPORTATION"

THIS FRUEHAUF PLATFORM TRAILER doubles in brass for Southern Dyestuff Corporation of Charlotte, N. C. Bulk SODYECO bulk orders are hauled in the removable tank shown above. But more often, the platform works with five Fruehauf Stainless Steel Vans hauling drums of dye. Here's what SODYECO'S W. C. Martin has to say about the way Fruehauf Trailers stand up to this tough job—

"Two years used to be maximum Trailer life with us. But our Fruehaufs have been with us going on three years with no signs of wear. We've found them ideal for an operation like ours in which Trailers must be continually exposed to corrosive plant fumes. And talk about cost of upkeep . . . with Fruehauf it's practically nil!"

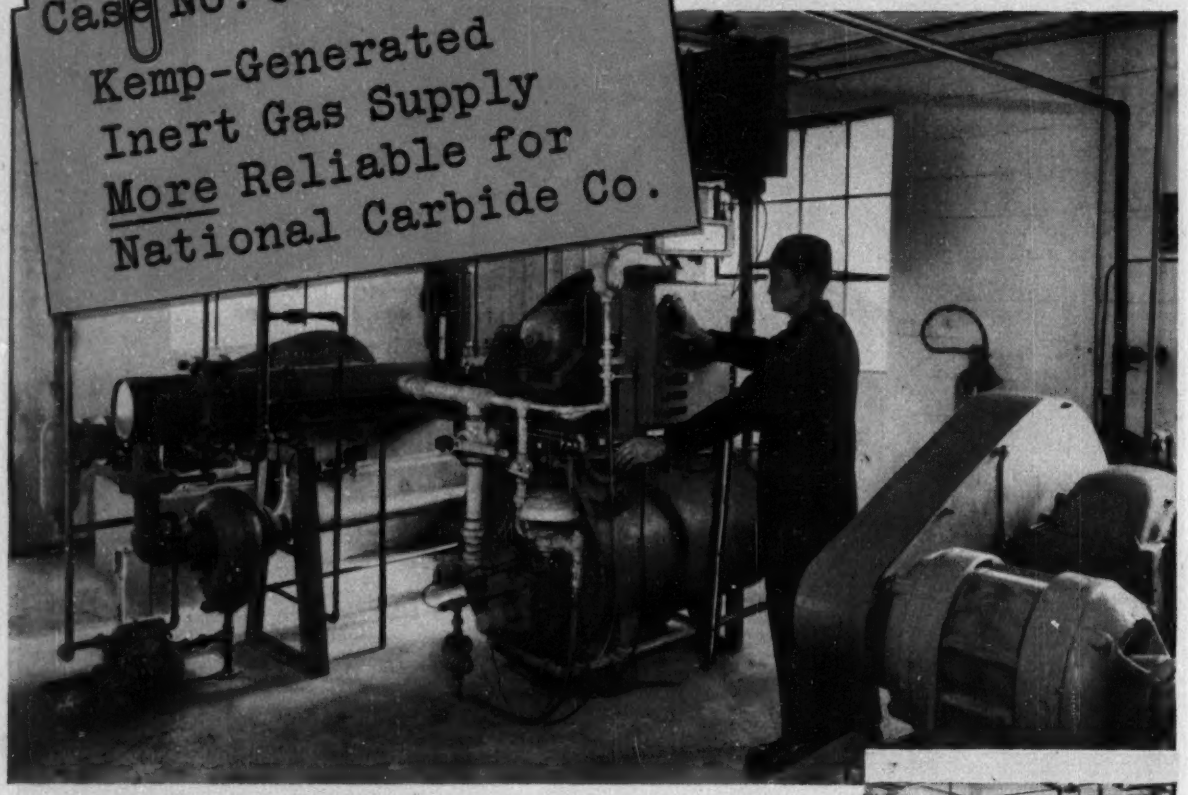
Put Fruehauf versatility and Fruehauf stamina to work for you. Your Fruehauf representative has full details.

World's Largest Builder of Truck-Trailers

FRUEHAUF TRAILER COMPANY
DETROIT 32, MICHIGAN

Case No. 56

Kemp-Generated Inert Gas Supply More Reliable for National Carbide Co.



How National Carbide meets the acetylene needs of 2 giant synthetic rubber plants

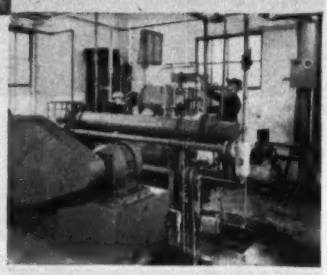
Supplying acetylene gas for both nearby B. F. Goodrich and du Pont plants is a full time job for the National Carbide Co. at Bell's Lane, Louisville, Kentucky. To make the job even tougher, highly explosive acetylene requires careful purging from its initial calcium carbide stage through ultimate pipeline delivery. To solve this problem, National Carbide formerly relied on its own supply of pure nitrogen. But demand soon far exceeded supply. The next step was the installation of 2 Model MIHE, Kemp Inert Gas Generators. (See above.)

Kemp "fills the bill"

By installing these Kemp Generators, National Carbide assured a dependable supply of inerts. But equally important to its overall operation is the ability of Kemp equipment to deliver a chemically clean inert at a *specific analysis* . . . without fluctuations *regardless of demand*. As Mr. Astor Brown, Works Manager, states, "the equipment is standing up well . . . no trouble . . . and meets our needs very satisfactorily." In addition, each Kemp Generator is engineered for fast-starting, easy operations that save both *time* and *money*.

Kemp Designs both flexible and versatile

Like National Carbide, you can't go wrong when you specify Kemp. Every Kemp design includes up-to-the-minute fire checks and safety devices. And every Kemp design features the Kemp Industrial Carburetor (uses ordinary gas right from the main) to assure you complete combustion . . . without tinkering . . . without waste. Let us help you with your blanketing or purging problems, too.

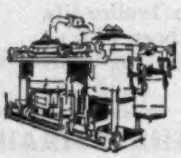


Here Mr. J. S. Carey, Acetylene Plant Foreman, is shown lighting the burner on Kemp Generator at Louisville plant. To the right rear can be seen a Kemp Oriad Dryer where inerts are dried after passing through specially designed inert cooling system.

For more complete facts and technical information, write for Bulletin I 10 to: **C. M. KEMP MFG. CO., 405 East Oliver Street, Baltimore 2, Maryland.**

KEMP OF BALTIMORE

INERT GAS GENERATORS



CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • ADSORPTIVE DRYERS
SINGEING EQUIPMENT

Efficient, New Gyratory

ALL-METAL CIRCLE SIFTER

Licks Cleaning and Grading Problems

THE VERSATILE *CIRCLE* SIFTER is built to help solve your problems of controlling quality and lowering manufacturing costs. When you use this modern sifter for cleaning and grading, you know your product contains no foreign material. And, to help lower manufacturing costs, you get consistent, highly accurate grading on a capacity basis.

The reason behind the *Circle* Sifter's efficiency is a true gyratory sifting action. It is quiet, smooth and vibrationless . . . exposes the sifted product gently but efficiently to the maximum of screen openings.

The *Circle* Sifter is a compact, self-contained, low-maintenance unit . . . requires little floor space . . . is dust tight and is designed for quick and easy changeover from one application to another by simply changing the sieves.

SEND FOR BULLETIN! Ask any A-C representative for bulletins 06B7633 and 06B7625 and the complete story on the *Circle* Sifter. Or, use the handy coupon.

Circle is an Allis-Chalmers trademark.

IDEAL FOR CHEMICAL INDUSTRY!

Allis-Chalmers
P. O. Box 512
Milwaukee 1, Wisconsin

☐ Send bulletins 06B7633 and 06B7625.
☐ Please have A-C representative call.

Name .....

Title .....

Company .....

Address .....

City ..... State .....

A-3822

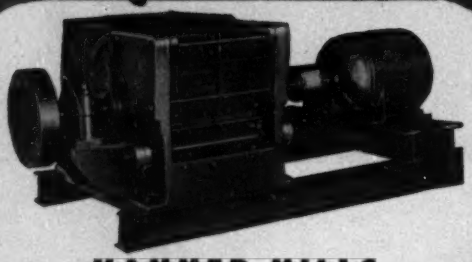
ALLIS-CHALMERS

CHEMICAL MILLING AND A-C PROCESSING EQUIPMENT

Crush It! Grind It Separate It

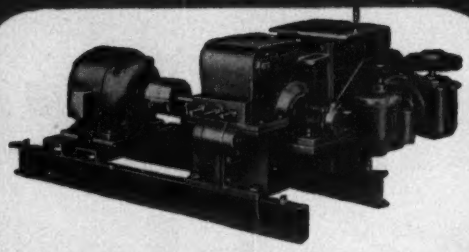
Do It Better, Faster And At Less Cost With...

WILLIAMS



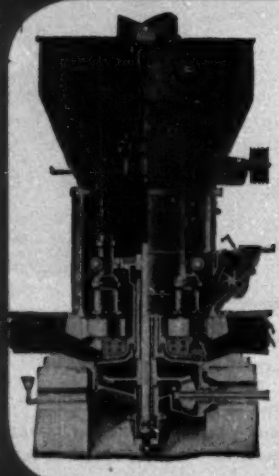
HAMMER MILLS

For heavy duty crushing or grinding of virtually any mineral or chemical—Williams builds them to do *a complete job in one operation!* Primary and secondary crushers are unnecessary—extra foundations, conveyors, other equipment are eliminated! You can save up to 75% on initial investment—up to 50% on grinding costs with the right Williams Hammer Mill!



HELIX-SEAL HAMMER MILLS

For cleaner, safer dustless grinding of dry materials—or non-clogging, accurate grinding of wet, sticky or greasy materials—to finenesses of 100 to 325 mesh. Combines the advantages of a hammer mill with closed-circuit screw-type feed. No separators, fans or cyclones required. Available with steam or water jackets. Low investment—inexpensive to install and operate.



ROLLER MILLS

WITH AIR SEPARATION

For accurate, uniform pulverizing or blending. Instantly adjustable to finenesses down to 400 mesh, even micron sizes. Dries and grinds simultaneously. Automatic, self-adjusting feed. Many other exclusive engineering and construction features. Williams Roller Mills have set new standards for product quality, output and economy.

OTHER WILLIAMS EQUIPMENT

- *IMPACT and DRIER MILLS*
- *AIR SEPARATORS*
- *VIBRATING SCREENS*
- *COMPLETE "Packaged" PLANTS For Installation In Existing Buildings*

At Your Service

WILLIAMS TESTING LABORATORY

Consult Williams on any grinding, crushing, shredding or separation problem, no matter what the material. The most complete testing and research facilities are available without cost or obligation. Simply furnish enough raw material for a test run, and a sample or description of the finished product desired.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
3704 N. NINTH ST. ST. LOUIS 6, MO.

WILLIAMS

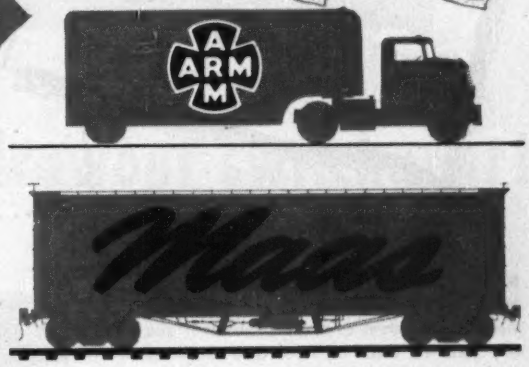
CRUSHERS GRINDERS SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

The only West Coast

manufacturer of a full line of

Sodium Phosphates



Only Maas gives you mixed truckloads or carloads of a full line of sodium phosphates delivered from the Maas plant to your door. Consistent quality has made Maas the preferred source of supply for all sodium phosphates.

A. R. MAAS CHEMICAL CO.

Division of Victor Chemical Works

4570 Ardine Street South Gate, California

What do you do when it takes hours... sometimes days... to change v-belts?

1 **Put one or several maintenance men on the job**

...and pay for repairs while production stands still

2 **Pay overtime**

...and have repair costs eat away your profits

3 **Standardize on VEELOS...**

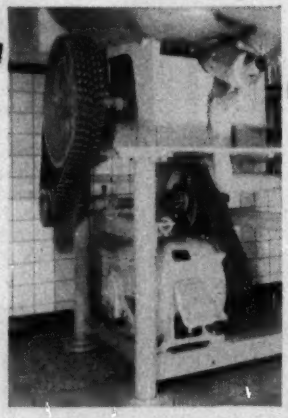
...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit

Comparison proves the value of VEELOS...

Minimum Inventory—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

Quick Installation—link construction makes it unnecessary to remove outboard bearings.

Complete Adjustability—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.



VEELOS DATA BOOK

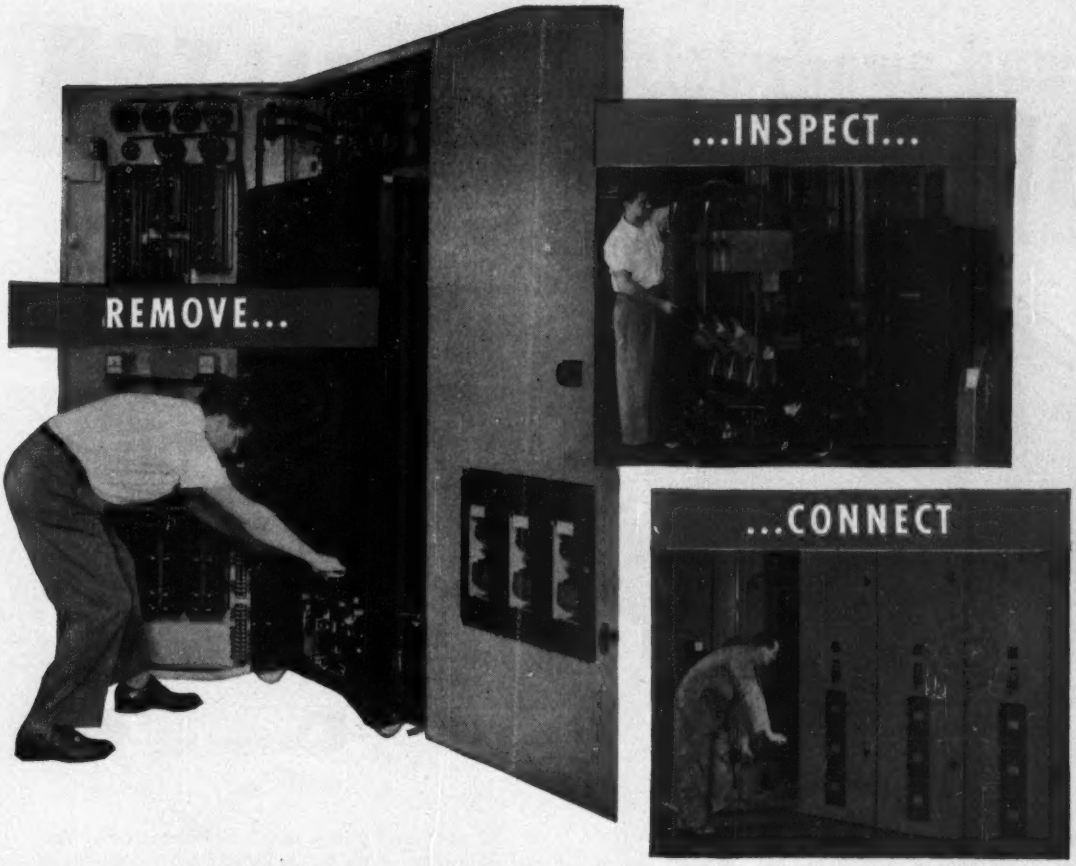
gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

MANHEIM MANUFACTURING & BELTING COMPANY
602 Manheim St., Manheim, Pa.

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.



It's easier, faster, safer with Westinghouse horizontal drawout switchgear!

You can remove breakers, inspect them, and replace them in only a few minutes when you use Westinghouse Type DH Metal-Clad Switchgear. Because breakers are drawn out horizontally, no lowering or lifting is necessary. A shutter indicator, visible from the front, provides positive indication of disconnect position. As the breaker is withdrawn, a grounded metal shutter closes to isolate stationary contacts.

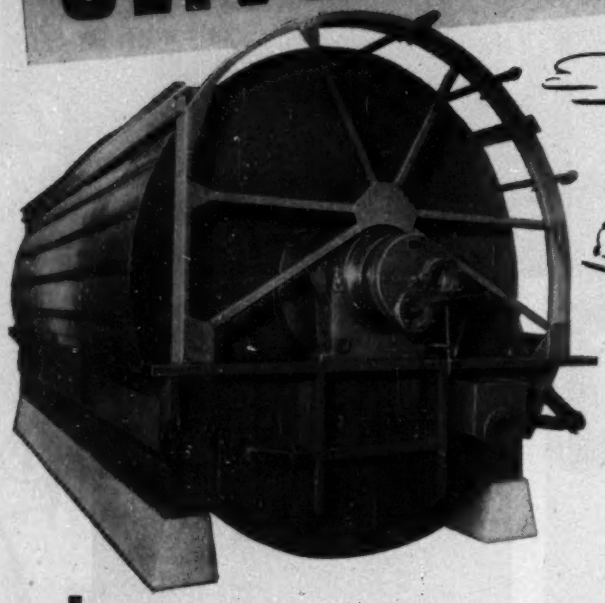
When the breaker is removed, interphase barrier and arc chutes remove easily to expose contacts at an accessible and convenient working height for quick inspection.

Replacing the breaker is just as easy and safe. A few easy turns of a crank move the breaker from disconnect to operating position. A mechanical interlock positively prevents engagement of crank linkage unless the breaker is open.

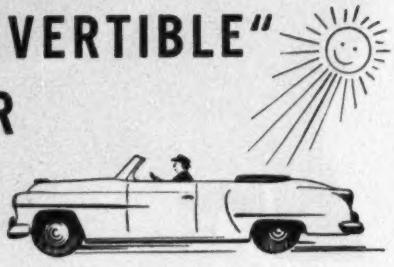
For complete information on Westinghouse Metal-Clad Switchgear for indoor or outdoor service write for Booklet B-5306. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60792

OLIVER Panel FILTER



THE "CONVERTIBLE" FILTER



Let's suppose, for a moment, that you order this filter to handle a 'difficult-to-filter' product which tends to form either an exceptionally thin cake or a sticky, slimy cake that would soon blind the cloth. Such a cake calls for the Panel Filter — if you want to save the solids.

Then, two or three years later, your processing changes so that you needed to filter a product that would form a more normal cake, say, from ½ to 1 inch thick.

Would you need a new filter? Not necessarily. You can easily convert the Oliver Panel Filter to a standard Oliver Wire Wound Drum Filter, adding a scraper discharge which would probably be better for handling the thick filter cake. Foreseeing the possibilities of changing processes, several companies have recently purchased Oliver Panel Type Filters with this very possibility in mind. Perhaps the "convertibility" of the Panel Filter will be a major factor in your selection. Why not discuss it with one of our filtration engineers?

Bear in mind that when our engineer discusses your problem, he has back of him forty-five years of Oliver United filtration service to industry all over the world, and many types of filters from which to select. This selectivity from some 20 different types of filters—continuous vacuum, continuous pressure, and batch pressure—assures you of getting the *right* type of filter for your problem.

NEW YORK 36 – 33 West 42nd Street • CHICAGO 1 – 221 North LaSalle Street
OAKLAND 1 – 2900 Glascock Street • SAN FRANCISCO 11 – 260 California Street
Export Sales Office – New York • Cable – OLIUNIFILT

FACTORIES:
Hazleton, Pa.
Oakland, Calif.

OLIVER UNITED FILTERS OUF INC. **inc.**

WORLD WIDE SALES, SERVICE AND MANUFACTURING FACILITIES

Direct Representation

WEST INDIES
Wm. A. Powe
Havana, Cuba

CANADA
E. Long, Ltd.
Orillia, Ontario

MEXICO & CENT. AMERICA
Oliver United Filters Inc.
Oakland, Calif.

HAWAIIAN ISLANDS
A. R. Duvall
Honolulu

PHILIPPINE ISLANDS
E. J. Nell Co.
Manila

AUSTRALASIA
Hobart Duff Pty., Ltd.
Melbourne

Representation through The Dorr Company and Its Affiliates

EUROPE, NORTH AFRICA & INDIA

Dorr-Oliver S. A. Brussels
Dorr-Oliver S.N.a.R.L. Paris
Dorr g.m.b.h. Wiesbaden (16)
Dorr-Oliver Co., Ltd., London, S.W. 1
Dorr-Oliver S.a.R.L. Milano
Dorr-Oliver, N.V. Amsterdam-C
Dorr-Oliver (India) Ltd., Bombay

SOUTH AMERICA & ASIA
The Dorr Co.
Stamford, Conn.

SOUTH AFRICA
E. L. Bateman Pty., Ltd.
Johannesburg, Transvaal

steam trap trial shows how to increase production

FREE
60-DAY TRIAL

Prove what Yarway Impulse Steam Traps will do in your own plant. Install a trial trap. See your Industrial Distributor or write direct.

Flat-work ironers in Pennsylvania laundry heat up in 15 min. with Yarway traps instead of previous 1½ hours.

West Coast Rubber molding plant cut heating cycle on presses from 15 minutes to 8 minutes by using Yarway traps.

Kettles in New England hospital kitchen reach cooking temperature in 12 minutes with Yarways instead of previous 25 minutes.

Southern textile mill gets satisfactory slasher production for first time due to faster heat-up with Yarway traps.

These 4 plants—each in a different industry—have something in common. Each installed a Yarway Impulse Steam Trap on a trial basis—and after witnessing the production-boosting results, they standardized on Yarway traps.

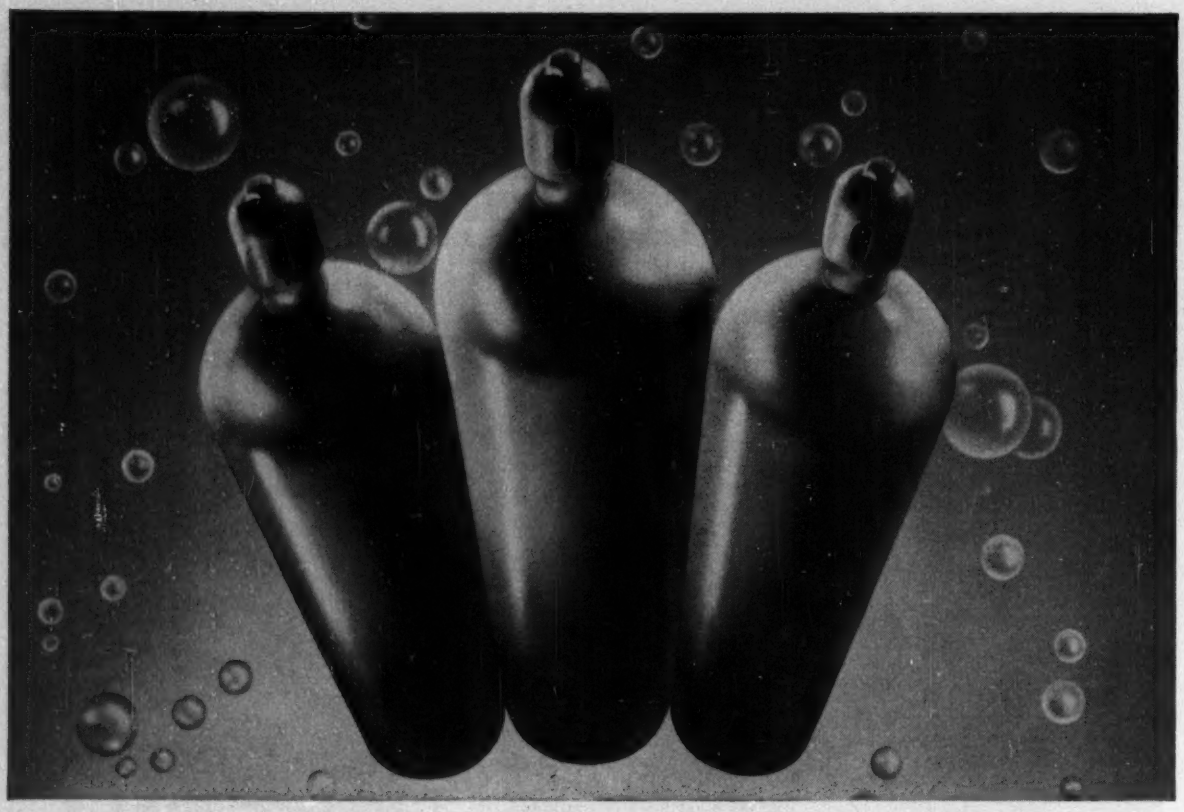
Experiences like these are found in hundreds of plants because Yarways are *designed* to get equipment *hot in a hurry,* and therefore into production fast.

Coupled with other Yarway Impulse Steam Trap advantages like small size, easy installation, stainless steel construction, easy maintenance and low cost—it explains why more than 800,000 Yarways have already been installed.

YARWAY

the steam trap designed with more production in mind

YARNALL-WARING COMPANY • 137 MERMAID AVENUE, PHILADELPHIA 18, PA.



SHIP 'EM FULL...OR SHIP 'EM EMPTY...

Hackney Lightweight Cylinders

SAVE YOU PLENTY!

There's no excess weight in a shipment of Hackney Seamless Compressed Gas Cylinders—no waste freight charges out *or* back.

For one reason—selected, high-quality steels assure adequate strength and light weight. For another—the Hackney process of cold drawing results in a uniform sidewall thickness that eliminates excess material.

MADE FOR THE SAFE TRANSPORTATION AND STORAGE OF MANY GASES—Hackney cylinders are convenient to handle... easy to fill and empty. They resist transportation and handling abuse ...*more than meet* all ICC regulations.

Write for complete information on the many types and sizes available.

Hackney

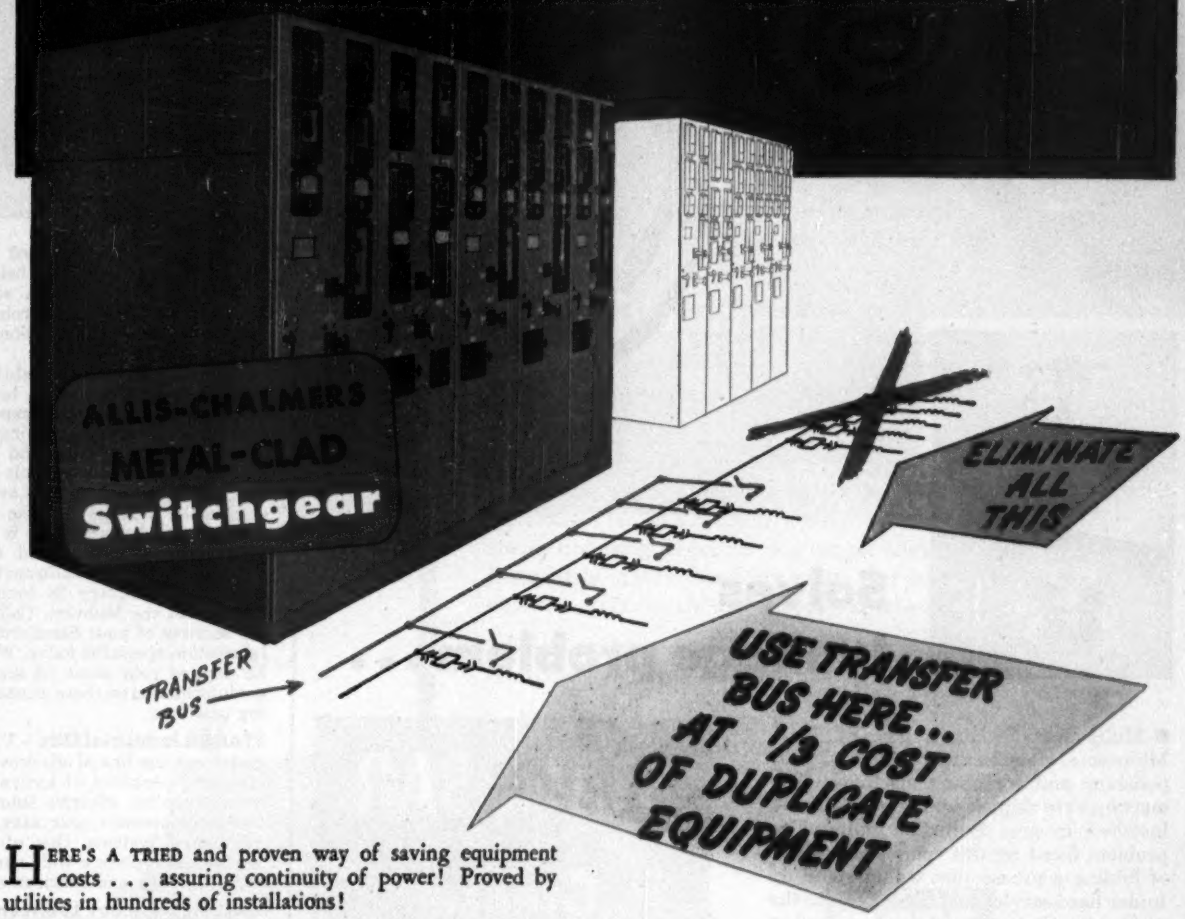
Pressed Steel Tank Company

Manufacturer of Hackney Products

1447 S. 66th St., Milwaukee 14 • 1325 Vanderbilt Concourse Bldg., New York 17
203 Hanna Bldg., Cleveland 15 • 936 W. Peachtree St., N. W., Room 113, Atlanta 3
208 S. LaSalle St., Room 792, Chicago 4 • 553 Roosevelt Bldg., Los Angeles 17
18 W. 43rd St., Room 15, Kansas City 11, Mo.

CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

Why Buy Duplicate Switchgear to Assure Power Continuity?



HERE'S A TRIED and proven way of saving equipment costs . . . assuring continuity of power! Proved by utilities in hundreds of installations!

What is a Transfer Bus?

It's simply a by-pass bus circuit that parallels the main switchgear bus. A switching means is provided so that loads can be transferred to the transfer bus. It's a standby in case anything happens to the main bus. Also, makes it possible to withdraw and maintain circuit breakers, or inspect main bus without power stoppage.

What are Other Advantages?

1. Saves Cost. Transfer bus costs about ⅓ as much as the additional equipment needed to provide duplicate switchgear to do this same job.
2. Cuts Space in Half. Allis-Chalmers supplies transfer bus in same cubicle as switchgear without adding cubicles. Thus an Allis-Chalmers installation cuts space one-half.

In addition, you can insure against failure of power source by providing a double end feed with the one set of switchgear and be as sure of power supply as if you had duplicate switchgear.

Depending on the job you want to do, there are many arrangements that Allis-Chalmers can provide. In many cases, the engineering has already been done.

Ask an Allis-Chalmers engineer about transfer bus arrangements and what they can mean to your plant in savings and service. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3731

ALLIS-CHALMERS

First in the U. S. with Metal-Clad Switchgear

Solves leakage problem . . .

● Multi-clean Products, Inc., St. Paul, Minnesota, manufactures industrial floor polishing and scrubbing machines. The machines are shipped with grease already installed in gear reduction units. The problem faced by this company was one of finding a grease that would stand up under hard service and not leak from the gear units. Greases tried either caused or threatened leakage troubles.

Called in on this problem, a Standard Oil lubrication specialist recommended STANOBAR Grease "S", a highly stable grease with a unique adhesive characteristic. Given an accelerated service test, STANOBAR did not leak from the gear unit, and its consistency showed no change that would later cause a leakage problem. There was no wear of gears or bearings. Adopted for use in the units, STANOBAR has solved this company's lubrication problem on every count. Officials have been able to eliminate the costly and troublesome practice of having all units returned to the factory, at 12 months intervals, to be repacked with grease.

STANOBAR
TRADE MARK
Grease

The same lubricating qualities of STANOBAR that solved this problem for Multi-clean Products, Inc. can serve you in a wide variety of applications. A Standard Oil lubrication specialist will be glad to discuss those applications with you. He's right there in your section of the Midwest. You need only phone your local Standard Oil office. Or write, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?

C. L. Daub is the Standard Oil lubrication specialist who helped Multi-clean Products, Inc. solve an important lubrication problem through his recommendation of STANOBAR Grease.

Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own schools. And like all lubrication specialists, his on-the-job assistance is always available to the industries in the immediate area he serves. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest. Call for the services of your Standard Oil lubrication specialist today. When he stops at your plant, be sure to get information on these outstanding products:

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One of two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants—On open gears and wire rope, these greases resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

STANORUST Rust Preventives—The eight grades of STANORUST form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically and specially developed for its intended use. The grades range from a fingerprint remover to a heavy semi-solid that protects against corrosion for years under the most severe outdoor exposure.

STANDARD OIL COMPANY

STANDARD *(Indiana)*

LUBE OIL TEMPERATURE: NORMAL

In spite of high speeds and heavy duty

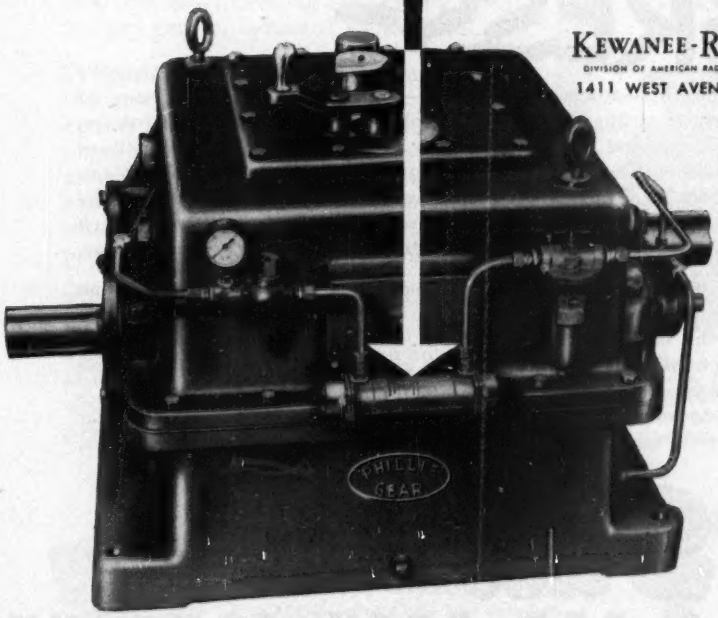
a Ross exchanger sees to that

Heavy shock or impact loading, high speeds or heavy duty are no threat to lube oil temperatures in Philadelphia Change-Speed Units. *A Ross Exchanger sees to that!*

Factory-installed by Philadelphia Gear Works, Inc., this compact Ross Exchanger keeps oil temperature within recommended limits. As a result, gears and bearings are never lacking of sufficient lubrication at required viscosity.

The use of Ross Type BCF Exchangers for this application, as for numerous others, has unique advantages for both machinery builder and user. Among them: Enduring all-copper and copper alloy construction; Completely standardized, pre-engineered designs to expedite procurement and simplify installation.

For complete information on this, the most specified of exchangers, write for Bulletin 1.1K5.



KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1411 WEST AVENUE BUFFALO 13, N. Y.

ROSS
exchangers

Serving home and industry

AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

of PROGRESS—

Juggling the world's smallest components—atoms and elements—demands the services of some of the world's largest, strongest and most complicated equipment. The petroleum, petrochemical, chemical and atomic energy industries have marched forward in seven-league boots because gigantic plants like Sun Ship have been able to make the "boots." . . . They have kept pace with the engineering needs of the industries . . . have been able to place in the scientist's hands the "tools" which enable him to mold elements as old as the world into products as new as today.

There has been what might be called a chemistry of progress at work in Sun Ship's mighty plant to match the progress of chemistry. The services of its great shops, the skills of its thousands of workers, have been adapted like atoms into new patterns which enable the great plant to make and fabricate the array of equipment . . . the engines and machinery . . . pressure vessels . . . fractionating towers . . . stills . . . tanks . . . catalytic cracking cases and other equipment which serve modern chemistry in building a greater America.

Sun

SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

ON THE DELAWARE • CHESTER, PA.

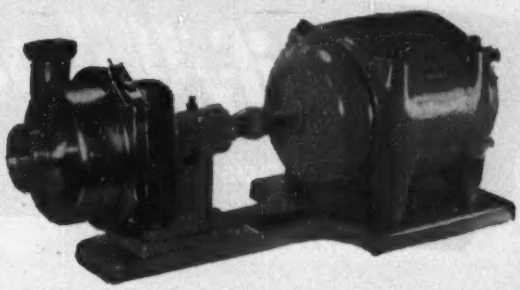
25 BROADWAY • NEW YORK CITY

Here are the PUMPS that will handle ANY PRODUCT that will flow to them . . .

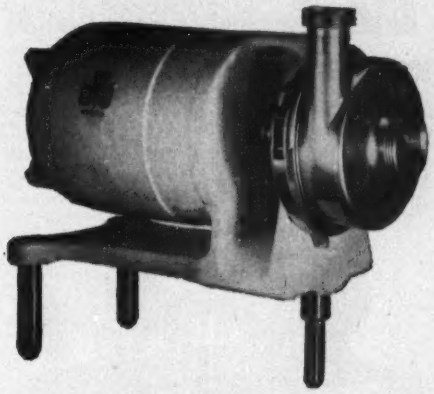
ANY product that will flow to them can be handled efficiently and economically with Tri-Clover non-agitating centrifugal pumps. Illustrated are three of the many Tri-Clover pump models which are used for dairy and food processing, brewing and bottling, chemical and general industrial applications.

Designed for efficient liquid transmission and low cost maintenance, these pumps feature patented screw type impellers with sanitary impeller clips, inert carbon seals easily removed for cleaning, streamlined lightweight heads with a minimum of parts, and the exclusive Tri-Clamp casing construction which permits fast, easy pump assembly or disassembly.

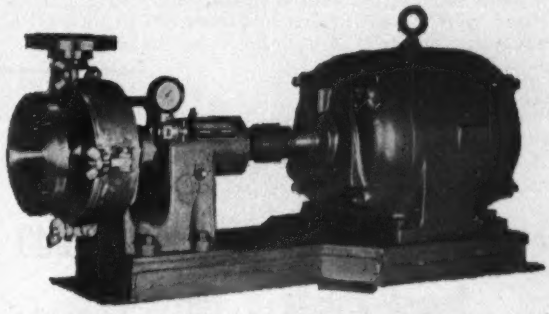
Tri-Clover's exclusive developments are the result of over 30 years of specialized engineering experience and thorough knowledge of liquid handling. Let our engineering staff work with you in solving your pumping problems.



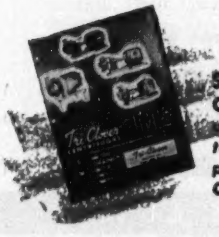
This model has been designed for the non-agitating, efficient pumping of milk, food products such as diced carrots, cream style corn, tomatoes, applesauce, relish and beverages. It is also practical in breweries and for the pumping of drugs and chemicals in solution.



Designed for very efficient operation at 1800 and 3600 RPM, and especially where high speeds are required, through heaters, coolers, filters, clarifiers, etc. The 3600 RPM model is especially applicable in the dairy industry, where high head and low capacity are essential and for handling low and medium viscosity liquids in the food processing industry.



Here is the model that is in demand to pump Latex, water, brine, light oils, chemicals, paints, brewery products, and liquids in the food processing field where lines are of heavy I. P. S. type. This model offers quick disassembly features for ease in cleaning.



SEND FOR THE TRI-CLOVER PUMP CATALOG—*One of the most complete, useful pump catalogs ever compiled. Contains engineering data on all types of pump applications. Write for your copy of Catalog 250 today.*

Tri-Clover®
MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

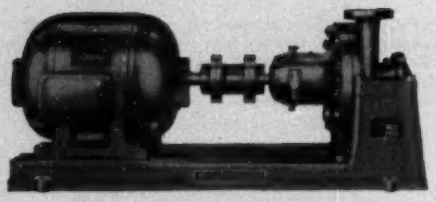
THE Complete LINE

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

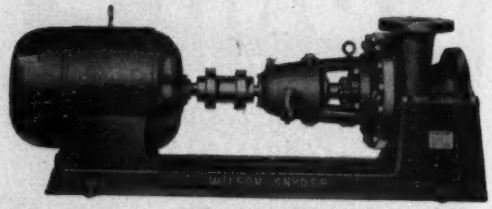
P188

Specify Wilson-Snyder Pumps

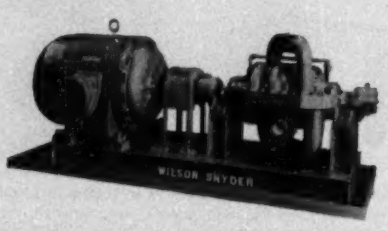
for unsurpassed service in Chemical Applications



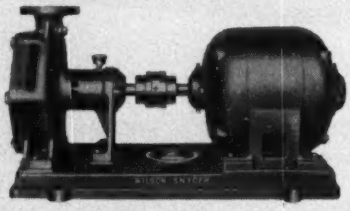
TYPE ESC PROCESS CENTRIFUGAL PUMPS . . . are single-stage, heavy-duty type with vertically split case and built-in mechanical seal. 9 sizes provide capacities at high efficiency from 15 to 1200 GPM, 40 to 470 foot head, 2 to 100 hp. at temperatures to 250°F. and pressures to 750 p.s.i.



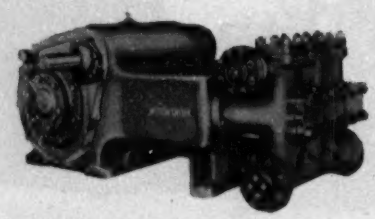
TYPE ES PROCESS CENTRIFUGAL PUMPS . . . are single-stage, heavy-duty type with vertically split case and extra deep stuffing box and bearings water-jacketed for temperatures to 900°F. 18 sizes provide capacities from 20 to 1800 GPM, 40 to 1100 foot head, 2 to 250 hp. at pressures to 750 p.s.i.



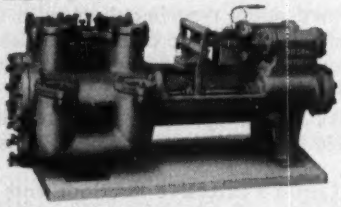
MULTI-STAGE CENTRIFUGAL PUMPS . . . are built for high efficiency and long life. Opposed impellers and staggered volutes provide inherent hydraulic and radial balance. Sizes from 2″ to 6″, capacities from 100 to 1300 GPM, pressures from 150 to 1350 p.s.i. and up to 1500 hp.



TYPE CS GENERAL SERVICE PUMPS . . . are designed with built-in mechanical seal and vertically split case to give dependable service at minimum cost at temperatures to 200°F. All parts except case, end-cover and impeller are interchangeable for all five sizes; with capacities from 5 to 550 GPM, 20 to 160 foot head and 1 to 10 hp.



TRIPLEX PLUNGER TYPE POWER PUMPS . . . for continuous, heavy-duty service are designed to handle a wide range of products including highly volatile fluids over a wide temperature range. Available in 4″, 6″, and 8″ stroke sizes for capacity requirements up to 260 GPM and pressures up to 5650 p.s.i.



DUPLEX PISTON TYPE STEAM PUMPS . . . are available in many standard size combinations for a wide range of service applications from sub-zero to 800°F. pumping temperature. Can be furnished to order in practically any size combination, and in a wide variety of liquid end materials. Steam jacketed liquid end construction available in many sizes. Entire line employs balanced piston type steam valve construction.

Write for Catalog containing complete specifications on

WILSON-SNYDER PUMPS

USS

WILSON-SNYDER WORKS — Braddock, Pennsylvania
OIL WELL SUPPLY DIVISION — UNITED STATES STEEL CORPORATION

UNITED STATES STEEL

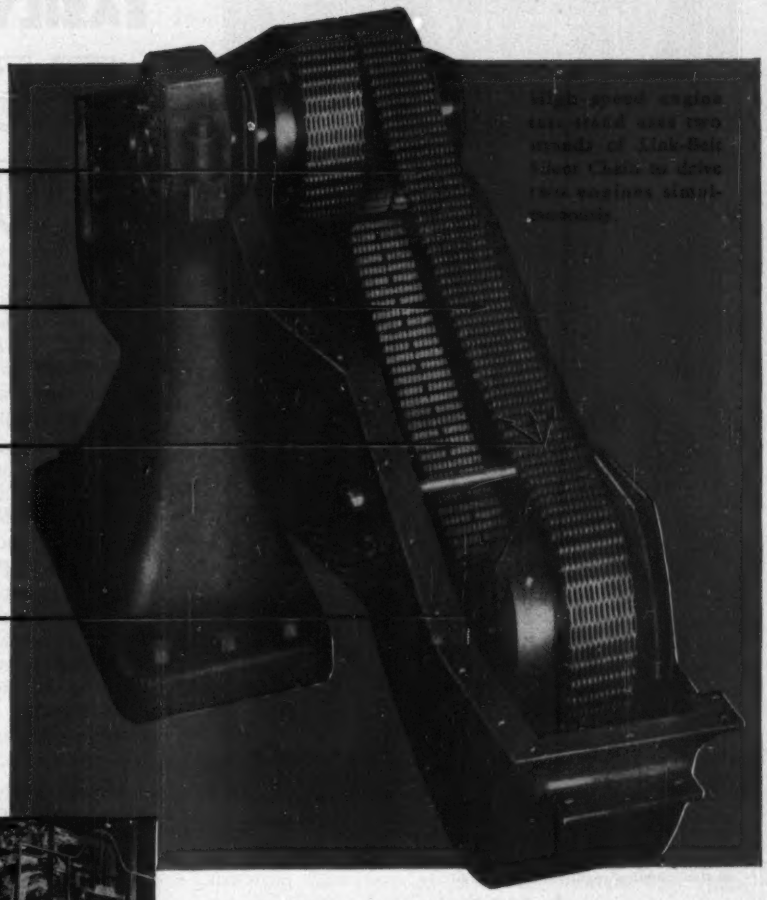
Choose the proved way
to transmit high hp at high speeds

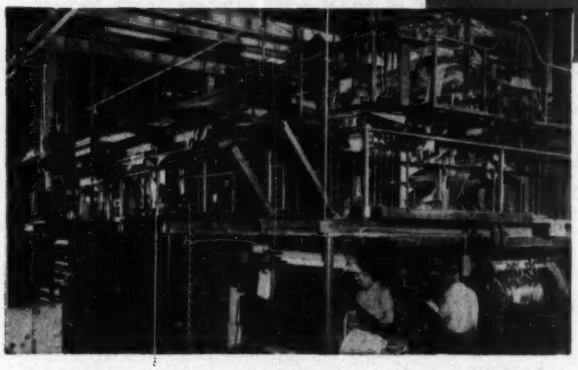
Silverstreak Silent Chain does the job with a single strand—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.

Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.

"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.

Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.





Four 125 hp Silverstreak Silent Chain Drives power this press on which 46% of all "Readers Digest" copies are printed. Chain speeds of 4600 fpm are maintained 24 hours a day, six days a week.

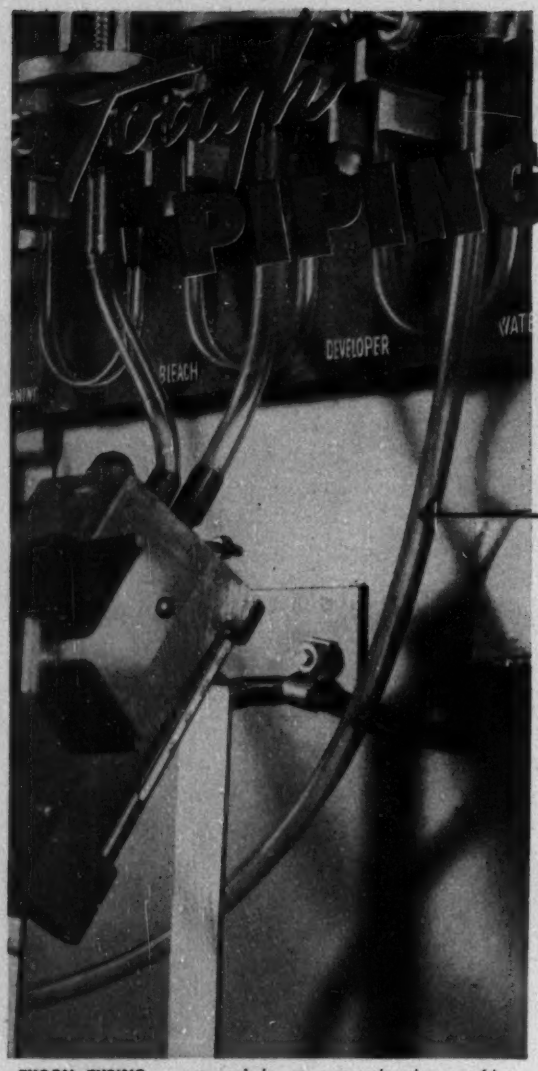
LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT Silverstreak Silent Chain Drives are slip-proof ... slap-proof ... shock-proof

For the finest in modern power transmission, use Silverstreak Silent Chain the next time you have a demanding drive problem. These long-life drives—more than 98% efficient—have met every test for rugged service. There are many applications where Silverstreak Silent Chain has been in continuous operation for 15 years and more ... without replacement ... with only routine attention. Call the Link-Belt power-transmission engineer in the office near you for any information you require.

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 12,000



TYGON TUBING — as used in an automatic picture taking machine. Here the clarity, flexibility, and resistance of TYGON to photographic chemicals has greatly increased service life, simplified operation, and minimized maintenance as compared to that obtained with rubber tubing.

PROBLEMS

EASILY SOLVED WITH

TYGON TUBING

Every day, tough piping problems — big and small — are being solved with versatile, plastic TYGON TUBING. Designers and engineers, throughout industry, are finding TYGON the quick, easy, positive answer to tricky transmission jobs involving liquids, gases, or semi-solids.

TYGON Tubing not only resists acids, alkalies, oils, greases, certain solvents, and water — but is glass-clear and fully flexible. TYGON also is strong, smooth-surfaced, abrasion-resistant, light in weight, and non-oxidizing. Certain formulations are completely non-toxic.

TYGON's excellent chemical resistance permits its use with virtually any corrosive. Its clarity permits full solution visibility and control. Its flexibility permits the most intricate use without kinking. Its smooth surfaces give maximum flow, easy cleaning, and free draining. Its non-toxicity assures complete safety in food, beverage or medical applications.

TYGON Tubing is made in continuous lengths and a number of stock sizes ranging from ⅛" ID to 2" ID. There are six standard formulations available in clear or glossy black which exhibit a range of physical, electrical, and chemical properties. Braided jacket reinforcement of stainless steel, Saran, or cotton is available and suggested where high constant pressures are encountered.

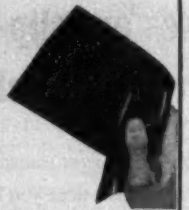
Special compounds and sizes — including rigid tubing — to meet specific requirements can be made where volume warrants.

Write, today, for more information and technical assistance on the use of TYGON Tubing. Ask for Bulletin-77. Ask also about the other forms of versatile TYGON that can help you combat corrosion.

TYGON PAINT

quickly applied, fast drying protection against corrosive fumes and spillage.

TYGON TANK LINING



long lasting, heavy duty sheet TYGON to withstand virtually all chemicals.

MOLDED TYGON

accurate, durable parts and fittings of outstanding chemical resistance for all types of equipment.

U. S. STONEWARE
AKRON 9, OHIO

TYGON Flexible Plastic TUBING

403-C

PLASTICS AND SYNTHETICS DIVISION

THE Chementator®

Prepared under the direction of Joseph A. O'Connor, News Editor

• Look for a vinyl resin plant to be built next to the Hooker-Detrex plant at Ashtabula, Ohio. The lure: cheaper anhydrous HCl, which Hooker-Detrex gets as a byproduct of its new trichlorethylene process.

• Gates Bros. of Wendell, Idaho, has teamed with Jefferson Lake Sulphur Co. on a 50-50 basis to produce sulphuric acid and 300 tons per day of triple superphosphate in a new Idaho plant. Gates will get sour gas from General Petroleum in Wyoming, recover 300 long tons of sulphur daily.

New producer to make electrolytic titanium?

An electrolytic process will really put titanium production into the big time. And don't be surprised if the government decides to back a new producer with an electrolytic process—perhaps with as much as $10 million. A firm decision may come this spring.

Likely new producer is Union Carbide or Horizons Titanium Corp., the latter a joint venture of Horizons, Inc., and Ferro Corp. After looking over several different processes for making titanium, Carbide singled out the Horizons process as the best yet, and quietly acquired rights to it.

Whether Union Carbide or Horizons Titanium becomes the actual producer remains to be worked out. Carbide may have a slight edge at present in the race to get into production, but ultimately both outfits may be making titanium electrolytically. Nor can Du Pont be scratched from the electrolytic race.

The Horizons process was developed by Dr. Eugene Wainer. Right now, two cells in the Cleveland pilot plant of Horizons Titanium Corp. are operating day and night, producing titanium electrolytically.

Tritium: fuel for the hell bomb

Tritium, perhaps combined with uranium or plutonium as the tritide of the metal, almost certainly was exploded at Eniwetok in the recent AEC tests leading to the development of thermonuclear weapons, otherwise known as H-bombs.

Combining the tritium, or hydrogen of triple weight, with uranium or plutonium would be one way to bring together the fissionable material of an A-bomb and the hydrogen isotopes that fuse with each other at the solar temperatures generated when an A-bomb goes off, releasing tremendous additional energy.

Tritium or deuterium could also be liquefied or even solidified and packed in around an A-bomb, multiplying its effectiveness. But this would mean cooling to within a few degrees of absolute zero and keeping the hydrogen isotopes cold until the bomb exploded.

Not only tritium, but mixtures of tritium and deuterium, possibly together with hydrogen itself, are probably being tested as fuels for an H-bomb. A mixture of tritium and deuterium may be the best bet.

How much added punch does tritium give to the H-bomb? That presumably depends on how much power it generates in excess of that of a plutonium bomb without the tritium in it. It would also depend on how much of the tritium actually fuses.

A new joint task force will go to Eniwetok for more bomb tests sometime fairly soon. Other tests are planned for Nevada.

These task forces aren't cheap. They transport up to 30,000 military and civilian personnel out to Eniwetok, take care of them for months and then bring them back. The 1951 trip cost taxpayers about $115 million, exclusive of the cost of the bombs that were exploded. The 1952 trip probably cost more.

Plans to go to Eniwetok again mean more tests are necessary before the construction of an actual H-bomb can begin. Volume production of H-bombs also awaits completion of the giant Savannah River plant in South Carolina by Du Pont.

Coming up, more aluminum

Aluminum expansion goes on apace. Calling for a third round of expansion, DPA has hiked its goal for annual U. S. primary production to 1.7 million tons by January 1955, an increase of 200,000 tons over the previous goal.

Biggest chunk of this third round increase has been wangled by Olin Industries. Olin has just about settled on a spot along the Monongahela River, near Morgantown, W. Va., for its $170 million plant that will

(*Continued*)

produce 110,000 tons a year of aluminum. Olin's power plant, incidentally, will be fueled by char—a coal residue.

Other contenders for the remaining 90,000 tons of capacity in DPA's new goal: Wheland Co. of Chattanooga, manufacturer of equipment used in the oil fields, and Harvey Machine Co., Anaconda's junior partner in the Montana aluminum project.

As it stands, Wheland has made a firm offer to DPA for production of 85,000 tons of aluminum, presumably with private capital. Harvey, now seeking to raise private funds, would build a $45 million plant at The Dalles, Ore., hopes to produce 45,000 tons of aluminum on its own, using McNary Dam power.

Prodded by mounting military and civilian demand, the aluminum industry is hustling this expansion of its capacity. Had power shortages caused by drought not crimped production, the industry could, at the end of 1952, have been turning out aluminum at the annual rate of 1,095,000 tons—63 percent of DPA's new goal.

Even so, the aluminum makers aren't satisfied. They're hatching another expansion of their own to add as much as 400,000 tons to capacity, over the DPA goal, by 1958.

Mushrooming atomic expansion

The U. S. Atomic Energy Commission will spend about $1 billion more for expansion in fiscal 1954 than in the current fiscal 1953, as its $5 billion expansion program quickens its pace.

Outlay for construction and equipment in fiscal 1954 will come close to $2.3 billion. Even at today's costs, that's a lot of construction.

Two ways to oxidize cumene

Production of phenol from cumene calls for the intermediate formation of cumene hydroperoxide. Allied Chemical & Dye Corp. has a method for accelerating the oxidation of cumene to its hydroperoxide. Hercules Powder Co. also has a process, which it acquired from British researchers, for the manufacture of cumene hydroperoxide. The two methods closely resemble each other.

In the Allied process, cumene in the liquid phase is contacted with elemental oxygen at 100 to 130 deg. C. until not more than 5 percent, by weight of the reaction mixture, of cumene hydroperoxide is formed.

Cumene is then treated with a strong base and oxidized, again with elemental oxygen, at about 110 deg. C. until the concentration of the hydroperoxide in the reaction products reaches at least 11 percent.

In the Hercules method, isopropyl benzene, which is cumene, is likewise oxidized in the liquid phase; molecular oxygen is used, but no catalysts are added.

The oxidation is carried out between 105 and 135 deg. C. with excess oxygen. To minimize the risk of explosion, steam is introduced into the gas space above the reaction mixture.

Creative technology: inexhaustible resource

Bewailing too much pessimism about this nation's future resources, Vice President Francis J. Curtis of Monsanto characterizes the problem as "mostly one of brains." He calls for a fourfold approach through exploration, substitution, conservation and, above all, technological advance.

EXPLORATION—"Only a pessimist will say there can be no great gain from future exploration," declares Curtis, citing recent finds of huge oil fields in Canada and tremendous ore reserves in Labrador. These suggest the possibility of undiscovered resources in the United States and in South and Central America.

SUBSTITUTION—Another highly significant way to eke out resources is by substitution. As an example, Curtis points out that between 1921 and 1949 plastics grew from only 5 percent of this nation's total consumption of non-ferrous metals and plastics to 51 percent by volume. Underscoring the importance of plastics, he says, "If every piece of plastic in this country were to fail in the next moment, all things utilizing electric power would cease to function."

Use of plastics likewise saves much electric power important in the U. S. economy. As Curtis points out, it takes 34 times as much electrical energy to make one cubic foot of aluminum as it does to make a cubic foot of polystyrene plastic and 25 times as much electric energy to make one cubic foot of steel as it does to make a cubic foot of polystyrene.

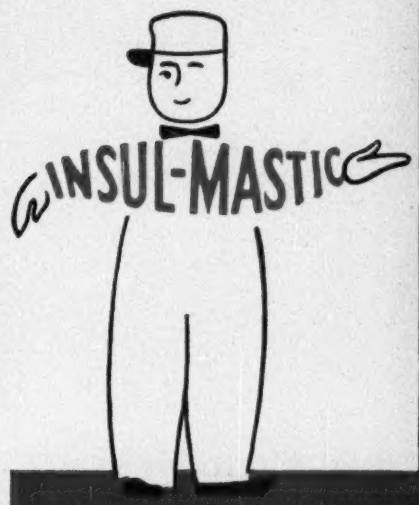
Synthetic fibers are also important replacement materials in America's economy. From 1939 to 1949 rayon jumped from 10 percent of America's total consumption of fibers to more than 19 percent. And nylon, first widely used in 1942, accounted in 1950 for almost 2 percent of U. S. fibers.

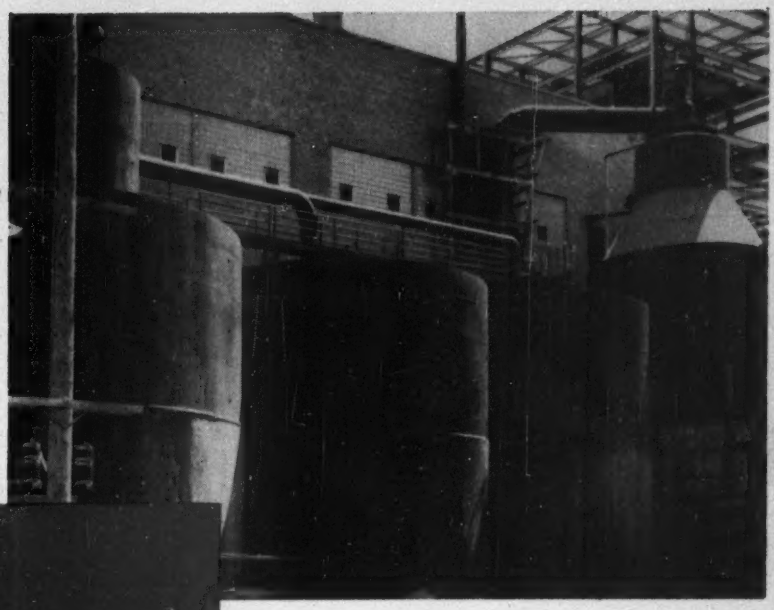
New wool-like synthetic fibers may be even more important in the future, according to Curtis, because they help to free this nation from dependence on foreign sources for the vast amount of wool needed in America, and because the synthetic fibers are tailor-made, eliminating many disadvantages inherent in wool.

CONSERVATION—To meet the challenge of shortages of food, lumber, cotton and other products that depend on annual crops, Curtis suggests conservation. By conservation he means using brains to figure out what can be done to make the land more productive and to find ways to keep from wasting products. An illustration of the use of brains here, he says, is the development of the slash pine in the South for the manufacture of newsprint.

Fertilizers, insecticides, fungicides and similar chemical products are used on the farm for conserva-

(*Continued on page 108*)





Only A SUPERIOR COATING ..... INSUL-MASTIC

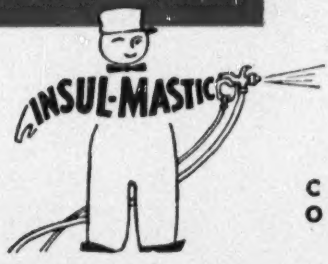
can keep your thermal insulation dry and protect the tank beneath it

Think first of the coatings that last!
CORROSION PROOFING
WATERPROOFING
VAPOR SEALING
INSULATION
Seal backs and joints of insulation and hold in place for banding with INSUL-MASTIC 8126Z . . . specially designed for buttering without rolling, clinging to the trowel or having uneven thickness.

17,000 square feet of tank surface at the Thilmany Pulp and Paper Company, Kaukauna, Wisconsin are protected by INSUL-MASTIC Coatings. INSUL-MASTIC 4010 vaporseals the joints and protects the surface of non-absorbent insulation on the lower half of filtrate tanks. Higher on the tanks, where less insulation is needed, INSUL-MASTIC TYPE "D" both insulates and prevents corrosion.

Where absorbent insulation is used, INSUL-MASTIC 4010 is needed even more because an inferior coating might permit rain or moisture vapor to dampen the insulation. Such a blanket of wet insulation held against your tanks for very long would cause severe corrosion that would mean complete re-insulating.

INSUL-MASTIC prevents such loss since its moisture vapor penetration rate is only .01 . . . practically nil. INSUL-MASTIC has exceptionally long life, due partially to the generous use of Gilsonite and mica. It is extremely resistant to acids and alkalis, a property of Gilsonite. Its temperature range is —40° F. to 300° F., and it is homogenized so that nothing settles in the drum.

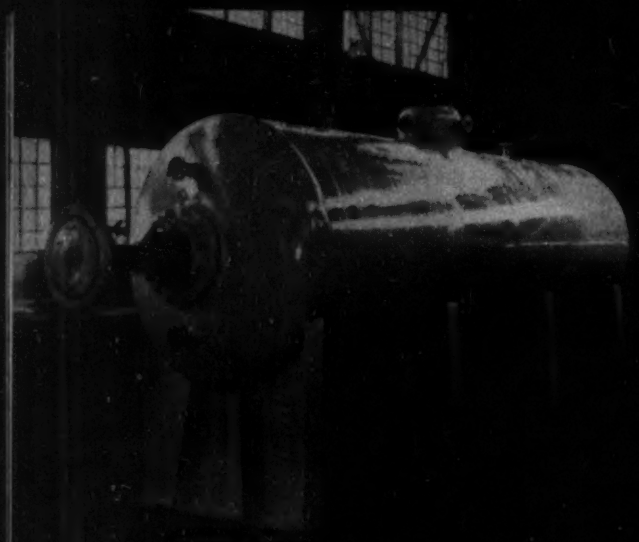


Insul-Mastic

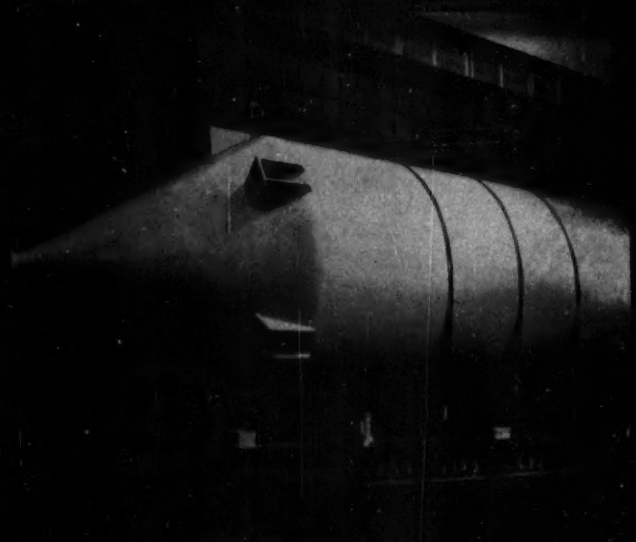
CORPORATION OF AMERICA

Oliver Building • Pittsburgh 22, Pa.

Representatives in Principal Cities



DEVULCANIZER



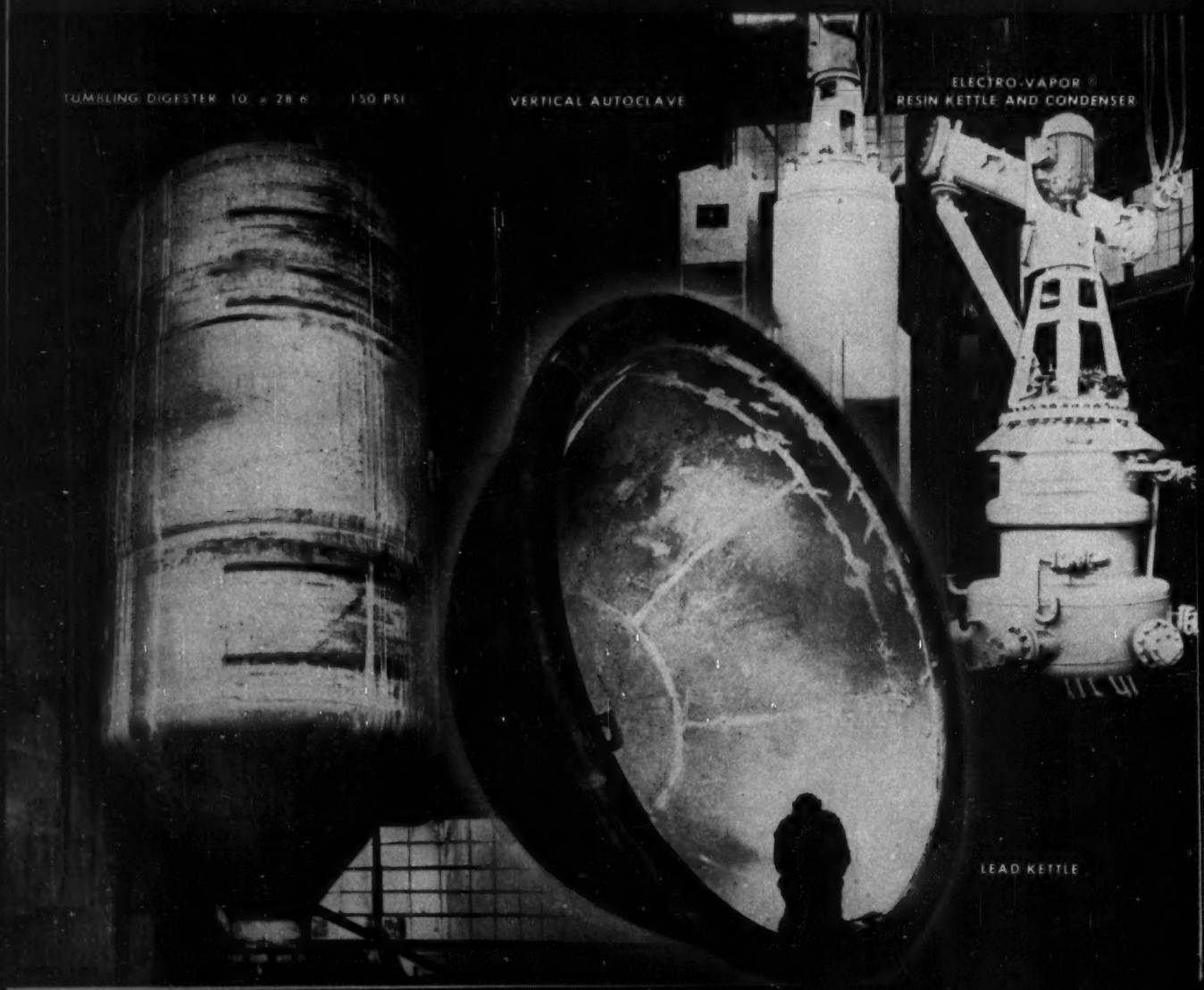
SULPHATE DIGESTER

Our Manufacturing Facilities

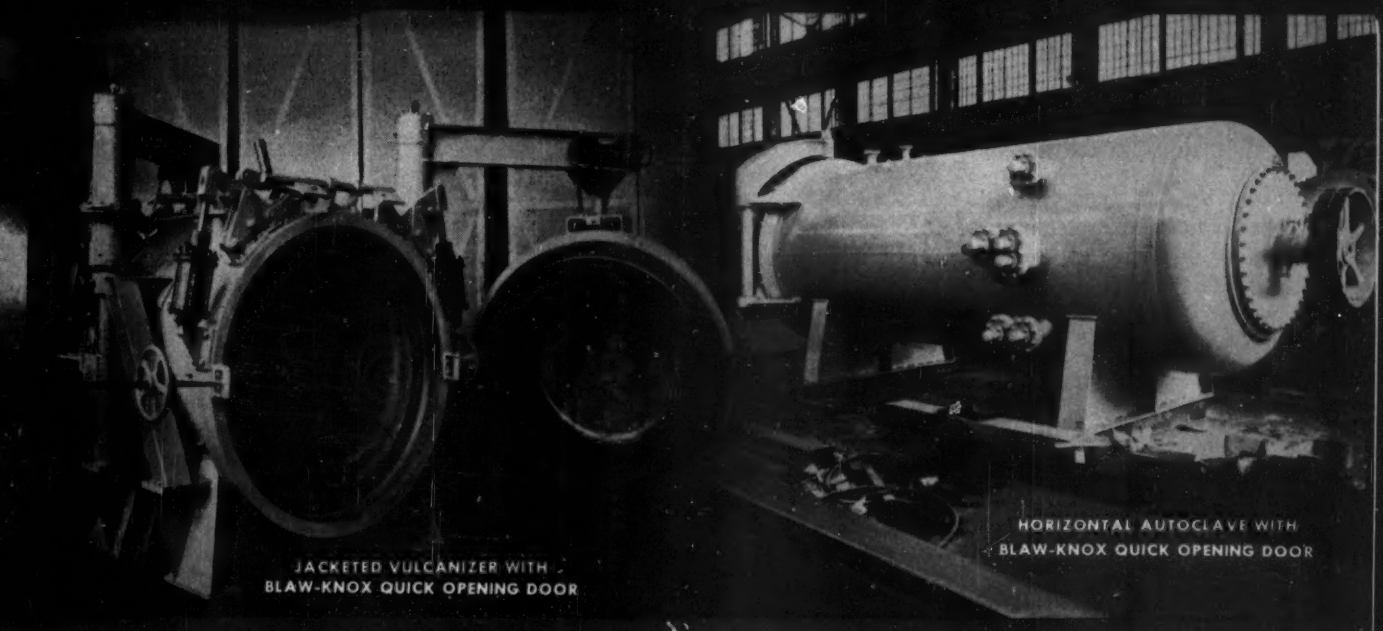
TUMBLING DIGESTER 10 ø 28 6 150 PSI

VERTICAL AUTOCLAVE

ELECTRO-VAPOR
RESIN KETTLE AND CONDENSER



LEAD KETTLE

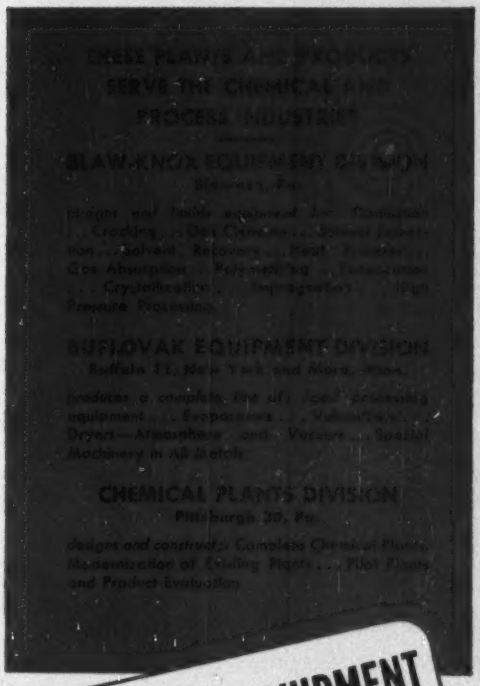


JACKETED VULCANIZER WITH BLAW-KNOX QUICK OPENING DOOR

HORIZONTAL AUTOCLAVE WITH BLAW-KNOX QUICK OPENING DOOR

IMPROVED to meet all modern needs!

EXTENSIVE modernization of plant and procedures enables us to build virtually any type or size of processing equipment to fulfill your requirements. Improvements include new equipment for rolling and shaping larger, heavier sheets and plates, improved X-ray equipment and new tooling throughout our shops. High-quality Blaw-Knox Process Equipment now costs no more than ordinary equipment. Take advantage of Blaw-Knox years and years of successful experience in serving the processing industries. For complete information write for Bulletin 2403.



BLAW-KNOX EQUIPMENT
DIVISION OF
BLAW-KNOX CO.
PITTSBURGH 22, PA.
Offices in Principal Cities

BLAW-KNOX

tion, Curtis says, rather than to exploit the soil. Fertilizers help to keep the farm productive for future years. Insecticides, fungicides and similar chemicals help to conserve the crops that grow each year so the fullest possible yield can be realized from the labor of U. S. farmers.

TECHNOLOGY—It is when Curtis comes to technology that his cup of enthusiasm runs over. "There seems to be no end to the products of technology," he declares. Technological advance holds the greatest hope for the future of this country's resources, according to Curtis.

Technology, for example, makes possible methods for producing titanium that have lifted the nation's capacity from 70 tons in 1950 to several thousand tons at present. And the technological development of atomic power, Curtis says, may make electric power from atomic reactors available in the next "four or five years."

Development of coal hydrogenation opens a new route to the production of chemicals from coal. When demand for aromatic chemicals outstripped the steel industry's production of coal tar, Curtis points out, technology came to the rescue with new ways to get these chemicals from powdered coal and hydrogen. This same development, according to Curtis, may eventually lead to the economic production of synthetic gasoline from oil shale and coal.

Other technological advances that Curtis cites include manufacture of synthetic rubber, the production of sulphur from waste refinery gases and the exploitation of the ocean as a source of magnesium.

Optimistic on the future of resources, Curtis is sure that requirements can be met by creative technology. "It isn't a case where you have to conserve or substitute, nor is it a place where you'll ever run out of raw materials, for the raw materials of technology are men's brains. As long as men go on thinking, as long as they are inquisitive, as long as they seek the answers to problems, as long as we build more and better scientists, then the products of technology will continue. And, because it is almost axiomatic that in technology one thing leads to another, the products of this year's thinking will be but a part of the chain reaction that makes technology almost inexhaustible."

New flow meter measures mass

Something new in flow meters is about to appear over the industrial horizon. The Li mass-meter, of which engineers first learned at the recent ASME meeting in New York, is on the verge of commercialization by a Norwood, Mass., firm, Control Engineering Corp. For the first time, engineers now have a practicable meter that measures, not volume or volume rate of flow, but actual mass rate of flow.

More important, the new meter measures nothing but mass. It is unaffected by temperature, pressure or viscosity. It works equally well with liquids, gases, solids or mixtures of these, provided only that the material will flow into it.

For example, a meter being built for a large processing concern will handle solid particles carried at a 1 to 1 weight ratio in a vapor. A vertical meter in a chute can equally well measure the pounds per hour of grain, sand or crushed coal. Handling liquids or gases imposes no problems—and gas flow doesn't have to be corrected for pressure and temperature variations.

Rare today is the flash of genius that suddenly gives rise to an idea in an inventor's mind. Yet that's how Dr. Y. T. Li, research associate at MIT, got the idea for the meter. He had a sleepless night not long ago and shortly after he had been asked to explain Coriolis acceleration. Meters were already on his mind. During the night he suddenly realized how Coriolis acceleration could be used to measure mass. Result: the mass-meter.

Coriolis acceleration and its resulting force are concepts in theoretical mechanics. It's believed that pigeons home by measuring Coriolis force resulting from the earth's rotation and their own motion. Sidewise movement of a plumb bob in a speeding elevator is a manifestation of this force.

Dr. Li's meter measures Coriolis force as a torque when material passing through a rotating pump-like structure is accelerated radially outward between vanes of an impeller and a casing that rotates with it. Tendency of the impeller to lag behind the casing furnishes the torque.

Since the torque is relatively large and is linear with both mass and rotational speed, the meter is inherently easy to calibrate, its range can be changed easily and it is highly accurate. Design depends somewhat on material to be handled, but the meter is simple and provides a straightforward means of measuring mass.

Allied to make polyamide fiber by own process

Getting into the lucrative synthetic fiber business, Allied Chemical & Dye Corp. will build a plant to produce a polyamide fiber of the nylon type. Allied developed its own processes for production of the new fiber and of the necessary new chemical raw materials.

Construction starts immediately on the 600-acre site at the confluence of the James and Appomattox Rivers just north of Hopewell, Va. Fiber production is planned for this site. Raw materials will be processed on a site next to the giant Hopewell plant of Allied's Nitrogen Division. All told, about 750 will be employed in the new operations. Allied's National Aniline Division will build and operate the new facilities and market the product.

Cost of the new manufacturing units will exceed $23 million, of which 40 percent will qualify for a fast

(*Continued on page 110*)

WORM GEARING—universal in its application—affords advantages for almost every power transmission job. Whether you want worm gearing sets or speed reducer units, you will find drives to meet your need in the complete Cleveland line.

Vickers Inc. hydraulic winch in operation on a Piasecki Hup-1 helicopter. Inset at left shows built-in Cleveland worm gearing.

Small Cleveland gearing speeds sea rescue

CLEVELAND worm gearing now has a part in a new kind of sea rescue. Just after the war, for the first time, a Vickers hydraulically-operated winch mounted on a helicopter hoisted two men to safety when an oil barge ran aground. Now use of the winch is standard practice, replacing hard-to-climb rope ladders previously used.

Vickers Inc. chose Cleveland worm gearing to drive the winch because it is small enough and light enough to satisfy rigid weight and bulk restrictions and is capable of governing efficiently sudden stops and starts and changes of direction involved in rescue work. To date Cleveland worm gearing has participated in over 1700 Korean missions.

Cleveland manufactures worm gearing and worm gear speed reducers in a wide range of types and sizes, large and small, to meet the requirements of any machinery builder or user. Write today for Catalog 400. The Cleveland Worm and Gear Company, 3273 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers, Limited.

tax writeoff. The certificate is one of four granted by DPA last July to increase U. S. capacity for production of synthetic fibers of the nylon type.

Allied expects initial production in about two years. The polyamide fiber, of high molecular weight, will be offered both as staple and as continuous filament yarn. Production of certain polymer grades in form for molding into plastics is also visualized. Annual output of the plant now being built will come to 20 million pounds.

Huge pulp and paper mill for Tennessee

When it gets going in 1954, the big $51 million paper mill that Bowaters Southern Corp. is building near Calhoun, Tenn., will chew up 906 cords of pine daily, spewing out each year 50,000 tons of kraft pulp and 125,000 tons of newsprint.

More than $7 million a year will be paid in wages and for wood supply. The plant itself will employ about 800 with salaries toting up to $3.5 million a year.

Sprawling over 1,400 acres along the Hiwassee River, the plant site can be reached by barge, rail and truck.

Two 252-in. newsprint machines will be installed in the plant. They are designed for speeds up to 2,000 ft. per min.

For a time, the problem of getting rid of waste from the mill had kicked up a rumpus in Chattanooga, downstream from Calhoun on the Tennessee River. But the problem has been solved.

The waste disposal system will have a large pump house for elevating the process waste to a 140-acre settling basin. Sludge from this basin will then be pumped to a permanent disposal area in a ravine on mill property.

Chlor-alkali plant for Hooker in B.C.?

Hooker Electrochemical's new Canadian subsidiary, Hooker Chemicals, Ltd., a British Columbia corporation, has acquired a 60-acre plant site on Burrard Inlet in North Vancouver, B. C. Hooker plans to manufacture chemicals in this area in the future. At present, Hooker ships substantial tonnages of chlorine and caustic soda from its Tacoma, Wash., plant to British Columbia's growing pulp and paper industry.

At the Burrard Inlet site Hooker can get low-cost hydroelectric power, transportation and other facilities and services needed to operate a modern chemical plant. Hooker's new Canadian subsidiary has acquired rights to lease adjacent tidelands with about 1,000 ft. on the channel providing deep water transportation for raw materials and finished products from the proposed chemical plant.

Here's why British Columbia looks so inviting to Hooker as the spot for a new chemical plant: (1) at present about $300 million is being pumped into actual and planned expansion of the pulp and paper industry in the area; and (2) Alberta crude oil and natural gas being piped into the Vancouver area are expected to play an important part in its industrial development.

International Minerals keeps on building

International Minerals & Chemical Corp. has a rash of new construction under way. Its output of phosphate chemicals keeps growing, and $14 million is being spent to construct a new plant at Bonnie, Fla., that will turn out 100,000 tons a year of phosphates for feed and for mineral manufacturers. The output of feed phosphates alone at Bonnie will quadruple International's capacity for these products. New phosphate reserves in Tennessee have been purchased that will extend phosphate operations for years.

At the close of its fifth year of operation, International's plant at San Jose, Calif., is in the midst of a $1.5 million expansion. Going up at Carlsbad, N. M., is a plant to produce hydrochloric acid and various high-grade magnesium oxides. Byproduct liquors from the potassium sulphate plant will be used in the process.

International also plans to sink another shaft at its Carlsbad potash mine at a cost close to $5 million. And soon it will build the first large potash plant in the Carlsbad area to use its new LeBaron-Lawver dry beneficiation process.

Harbinger of atomic power for industry?

How close is nuclear power for industry? Perhaps it may come within four or five years; it's hard to say for sure. However, here are a few straws in the wind.

Westinghouse has under construction or design three nuclear power plants of major size. One is the prototype of a power plant that could be installed in a submarine. It's a full-size working model of the submarine atomic plant located at the National Reactor Testing Station near Arco, Idaho.

The second plant is known as Mark II, and Westinghouse has started manufacturing many of its components. The submarine Nautilus, for which the keel has already been laid by the Electric Boat Co., will be the first submarine to get this new atomic power plant.

In the reactors for Mark I and Mark II, water is both the moderator and the primary coolant fluid. In the Nautilus, nuclear energy will be harnessed for large-scale controlled utilization of power for the first time, resulting in an around-the-world submarine.

The third project calls for Westinghouse to design and develop another nuclear power plant many times larger than the other two. It would power big naval vessels, such as aircraft carriers. Significantly, however, this plant could well be a forerunner of the reactors that will some day produce useful power, taming the atom for industry.

What's Happening, turn to page 112

Now! Another B&A Fluorine Compound in Tonnage Quantities!

POTASSIUM TITANIUM FLUORIDE

To serve the growing needs of the light metal industry, Baker & Adamson has recently inaugurated commercial production of high-purity Potassium Titanium Fluoride at its B&A Works, Marcus Hook, Pennsylvania. This marks another step forward in B&A's long-term program for the production of a wide range of inorganic fluorides in tonnage quantities.

For more than two decades Baker & Adamson has conducted extensive research in the field of fluorine chemistry. Today, it is geared to produce virtually any inorganic fluorine chemical that Industry might require. Listed below are the many fluorine compounds B&A now offers in commercial quantities. Many others are in the development stage.

If your present or projected operations call for Potassium Titanium Fluoride, or any of the other products listed below, make B&A your source.

For further information, check those that interest you and return the coupon clipped to your company letterhead.

REAGENTS B·A STANDARD OF PURITY FINE CHEMICALS

BAKER & ADAMSON *Fine Chemicals*

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

☑

B&A FLUORINE COMPOUNDS AVAILABLE IN COMMERCIAL QUANTITIES

Please send me further information on the items checked. I am interested in them for:

- ☐ Process use
- ☐ Research

ACIDS
- ☐ Fluoboric Acid
- ☐ Hydrofluoric Acid

ACID FLUORIDE
- ☐ Potassium Fluoride

ALKALI FLUOBORATES
- ☐ Ammonium Fluoborate
- ☐ Potassium Fluoborate
- ☐ Sodium Fluoborate

ALKALI FLUORIDES
- ☐ Potassium Fluoride

DOUBLE FLUORIDES
- ☐ Potassium Chromium Fluoride
- ☐ Potassium Titanium Fluoride

METAL FLUORIDES
- ☐ Aluminum Fluoride, Cryst.
- ☐ Chromium Fluoride
- ☐ Copper Fluoride

METAL FLUOBORATE SOLUTIONS
- ☐ Copper Fluoborate
- ☐ Ferrous Fluoborate
- ☐ Indium Fluoborate
- ☐ Lead Fluoborate
- ☐ Nickel Fluoborate
- ☐ Stannous (Tin) Fluoborate

NON-METAL FLUORIDES
- ☐ Boron Fluoride Gas
- ☐ Boron Fluoride-Diethyl Ether Complex
- ☐ Boron Fluoride-Phenol Complex
- ☐ Sulfur Hexafluoride

HALOGEN FLUORIDES
- ☐ Chlorine Trifluoride

Name_____ Title_____

Company_____ Address_____ CE-2

What's Happening

New Pyridine Plant Makes MVP

First commercial plant to produce methyl vinyl pyridine from petroleum has just been completed by Phillips Chemical Co. at Adams Terminal on the Houston Ship Channel near Pasadena, Tex. Initially it will produce about 2 million pounds per year of 2-methyl-5-vinyl pyridine, plus smaller amounts of related pyridine compounds.

Acetaldehyde and ammonia are the raw materials for the manufacture of methyl vinyl pyridine. Acetaldehyde is converted into paraldehyde in a preliminary step. Then the paraldehyde is reacted with ammonia to form 2-methyl-5-ethyl pyridine, which is dehydrogenated to yield the product (see *Chem. Eng.*, Nov. 1951, p. 228).

Paraldehyde for the synthesis of MEP is made by trimerizing 3 moles of acetaldehyde to 1 mole of paraldehyde in the presence of a small amount of sulphuric acid catalyst. Make-up acetaldehyde and sulphuric acid are fed continuously into the polymerization reactor, with the exothermic heat of reaction being removed by cooling water in an external heat exchanger.

The acid catalyst is neutralized and the paraldehyde purified by fractionation before its use in the MEP synthesis step.

MEP is synthesized by reacting the paraldehyde with ammonia in the liquid phase. In addition to methyl ethyl pyridine, a certain amount of 2-picoline, 4-picoline and heavy pyridine byproducts are formed. An excess of ammonia is maintained in this step.

Reaction effluent goes next to separation equipment, the excess ammonia being recycled to the synthesis step. Pyridine fractions, of technical-grade purity, are recovered, including a lower-boiling byproducts cut, a slops cut for rerun, an MEP cut, another slops cut for rerun and a bottoms product of higher-boiling pyridines. The MEP cut is sent to surge storage until it is used as feed in the MVP part of the plant.

Methyl ethyl pyridine, the intermediate product, is a clear liquid that boils over a range from 345 to 356 deg. F. at 1 atm. of pressure. While MEP itself has many uses, Phillips is interested in its dehydrogenation to MVP, which can be used in the manufacture of new synthetic fibers.

MEP is catalytically dehydrogenated to MVP. In addition to the main product, 2-methyl-5-vinyl pyridine, a certain amount of such pyridines as 2-picoline, 3-picoline, 3-ethyl pyridine, lutidine (2,5-dimethyl pyridine) and 3-vinyl pyridine byproducts are produced.

MVP is recovered as a final product. It can be shipped in drums, tank trucks or by railroad tank cars.

FEATURE NEWS

Pyridine 112
Enrollments 113
Sonic Shock 118
Alkyl Phosphites 126
Ethylene Oxide 134
Sulphur 138

CONVENTION CALENDAR

American Pharmaceutical Manufacturers Association, eastern section meeting, Roosevelt Hotel, New York, February 2-4.

Technical Association of the Pulp & Paper Industry, New York, February 16-19.

Manufacturing Chemists' Association, air pollution abatement conference, Statler Hotel, Detroit, February 26-27.

Drug, Chemical & Allied Trades Section, New York Board of Trade, annual dinner, Waldorf-Astoria Hotel, New York, March 5.

Society of the Plastics Industries of Canada, annual conference, General Brock Hotel, Niagara Falls, March 10-11.

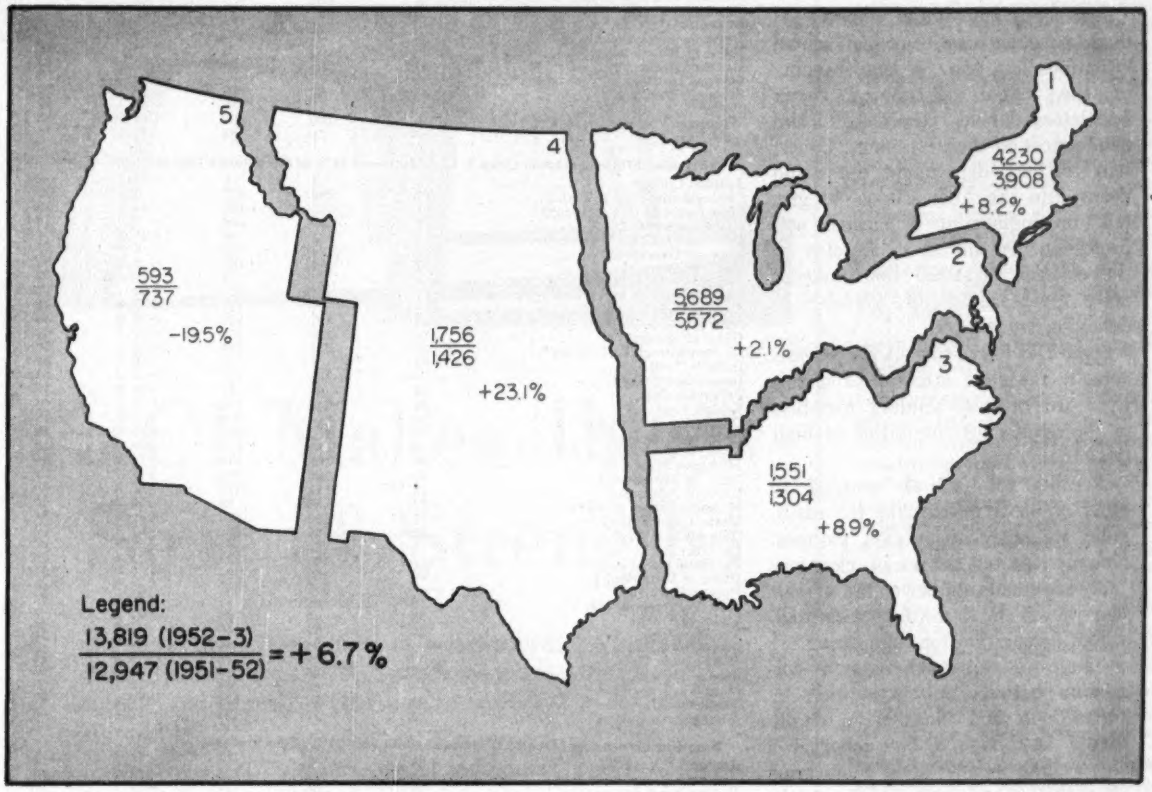
National Agricultural Chemicals Association, spring meeting, Jung Hotel, New Orleans, March 11-13.

National Association of Corrosion Engineers, Sherman Hotel, Chicago, March 16-20.

Southern Paint & Varnish Production Club, annual meeting, Buena Vista Hotel, Biloxi, Miss., March 18-21.

Commercial Chemical Development Association, annual meeting, Statler Hotel, New York, March 23-24.

in Chemical Engineering



IN THE ENGINEERING SCHOOLS . . .

Enrollments Are Up, Not Down

Nobody expected it but future chemical engineers flocked to the colleges last September. Here's what CE turned up in a comprehensive survey.

There were roughly twice as many chemical engineering freshmen this fall as last.

In October of 1951 the U. S. Office of Education totaled 2,647 chemical engineering freshmen in 105 schools. This year, CE's editors added up slightly more than 5,000 freshmen in 110 schools.

That's an astounding surge, especially against the bleak backdrop of forecasts from the experts.

It's this freshman boom that has boosted total CE enrollments over the country—an increase of 6.7 percent over last year. Every section of the country is up except the Far West.

It would be easy to come up with reasons for the peak enrollments—the draft, high general prosperity, lowering educational standards. But most of this would be second guessing—something that too many experts have been doing too often.

Obviously the dollar sign and the publicity have shown their powers of persuasion.

Right now there's no way of telling how the CE class of '56 will fare against the other big three—the mechanicals, electricals and civils but it's a good guess that among engineers the chemicals are growing faster and adapting faster than anybody figured.

▶ **Good Returns**—Altogether, CE's survey reached 118 schools listed by

the U. S. Office of Education. Of these, three reported no degree in chemical engineering and only six failed to reply to the questionnaire.

Most of the salient facts are listed in the table and graph. But there were some interesting sidelights too:

Each of the schools was asked whether it had any specific programs or suggestions for attracting high school graduates to the study of engineering.

Just about half of the schools (51) made a regular practice of high school visitations last year. A large number of the schools distributed career booklets and held "career days" and conferences on their campuses. Others sent teachers, department heads and deans into the high schools to give talks on engineering as a career and profession. A substantial number of the colleges suggested that industry make more scholarships available to deserving students.

▶ **Some Did Recruiting**—A few schools actually made an attempt to recruit their students by sending members of the admissions committee to high schools.

Another few schools resorted to other publicity outlets like the mails, radio stations, and motion pictures. Nobody reported the use of television.

A very small number of the schools said they were dissatisfied with high school preparation for engineering.

There was not much apparent correlation between self promotion by the schools and increases in enrollments. Although a few reported a sharp climb in interest in engineering since they began visiting high schools, it was less apparent among the majority. In fact, some of the sharpest enrollment gains were made by institutions which did nothing to attract students.

▶ **More Counseling**—Each of the schools was asked if it did any career counseling, aptitude testing or both for students and prospective students. Fifty-three replied "yes" to one or both, five replied "no" and the remaining 52 did not reply at all, indicating a probable negative answer.

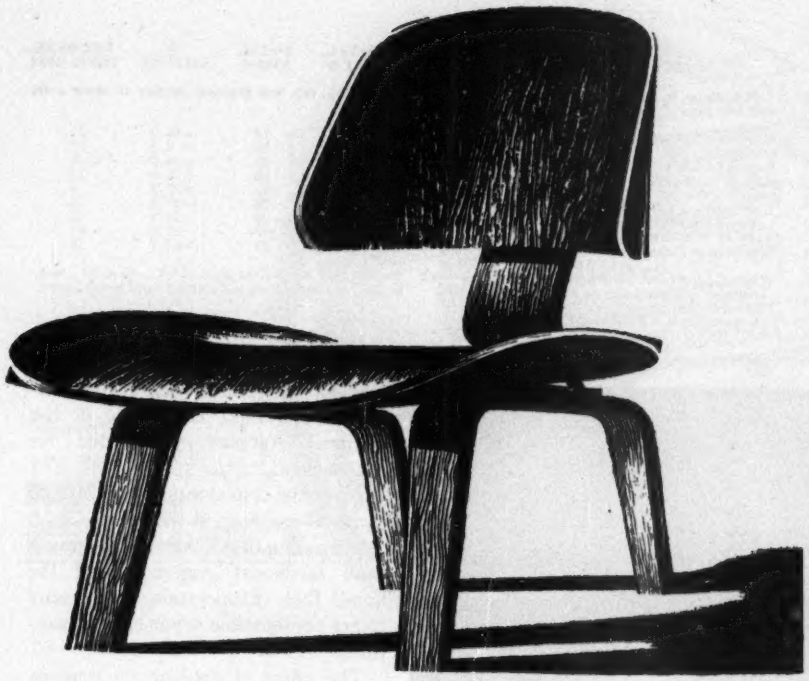
To the third question, "Do you think that industry is doing its fair share to help attract young men to engineering as a career?", 43 replied "yes," 33 "no," and three undecided.

It is significant to note that only one respondent thought to ask "is

THIS YEAR'S CHEMICAL ENGINEERING STUDENT ENROLLMENT

SCHOOL	FRESHMEN	TOTAL, 1951–2	TOTAL, 1952–3	% CHANGE	DEGREES, JUNE, 1952
Seven Eastern states (Area 1 on map, 24 schools) account for 31% of the nation's chemical engineering students					
Brooklyn Polytechnic Inst.‡	130	638	761	+19.2	85
Catholic Univ.	10	32	27	−15.6	12
City College of N. Y.	163	302	378	+25.2	40
Clarkson Coll.‡	42	150	143	− 4.7	45
Columbia Univ.*‡		121	133	+ 9.9	43
Cooper Union‡	24	137	137	none	18
Cornell‡	105	261	268	+ 2.7	33
Univ. of Maine*‡		82	76	− 7.3	21
Univ. of Mass.*	25	35	54	+54.3	3
Mass. Institute of Technology‡	160	474	518	+ 9.3	159
Newark College‡	69	450	438	− 2.7	77
Univ. of New Hampshire	31	59	70	+18.6	11
New York Univ.‡	57	322	202	−37.3	68
Northeastern Univ.‡	75	243	172	−29.2	57
Pratt Inst.‡	5	52	37	−28.9	17
Princeton Univ.‡	50	130	140	+ 7.7	35
Rensselaer Polytechnic Inst.‡	96	306	287	− 6.2	89
Univ. of Rhode Island*		32	24	−25.0	14
Univ. of Rochester‡	40	56	82	+46.4	12
Stevens Institute of Technology*					16
Syracuse Univ.‡	30	63	88	+39.7	32
Tufts*‡		51	42	−17.7	10
Worcester Polytechnic Inst.*‡		100	92	− 8.0	32
Yale Univ.*‡		79	88	+11.4	21
Thirty-nine Midwest schools (Area 2, 12 states) have 41% of the nation's ChE students on their rolls					
Antioch College	4	4	7	+75.0	
Carnegie Institute of Tech.‡	62	288	277	− 3.8	62
Case Institute of Technology‡	51	245	185	−24.5	56
Univ. of Cincinnati	73	269	255	− 8.9	56
Univ. of Dayton	28	33	40	+21.2	4
Univ. of Delaware*‡		143	132	− 7.7	37
Univ. of Detroit‡	57	202	182	− 9.9	61
Detroit Inst. of Tech.	5	20	18	−10.0	2
Drexel Institute of Technology‡	77	267	406	+52.1	37
Penn College*		76	71	− 6.6	17
John Hopkins Univ.	31	121	152	+25.6	30
Univ. of Illinois‡	76	289	238	−17.7	63
Ill. Institute of Technology‡	37	255	324	+27.1	56
Indiana Tech.	22	56	50	−10.7	24
Iowa State Coll.*‡		135	127	− 5.9	54
Lafayette Coll.	34	67	77	+14.9	16
Lehigh Univ.	94	240	241	+ 0.5	48
University of Maryland	24		201		19
Univ. of Michigan*‡		269	289	+ 7.4	58
Mich. Coll. of Mining & Tech.‡	44	88	111	+26.1	18
Michigan State Coll.	56	108	124	+14.8	34
Univ. of Minnesota‡	59	195	201	+ 3.1	51
Univ. of Missouri‡	43	111	119	+ 7.2	45
Missouri School of Mines‡	33	116	99	−14.7	41
Notre Dame Univ.‡	71	143	172	+20.3	31
Ohio State Univ.‡	51	262	206	−21.4	70
Pa. Univ.‡	18	72	71	− 1.4	19
Pa. State Coll.‡	117	290	294	+ 1.4	46
Univ. of Pittsburgh‡	42	198	202	+ 2.0	121
Purdue Univ.*‡		350	342	− 2.3	140
Rose Polytechnic Inst.‡	12	39	47	+20.5	15
Univ. of Toledo	22	42	59	+40.5	7
Tri-State Coll.	22	52	50	− 3.9	29
Villanova Coll.‡		54	40	−25.9	18
Washington Univ.‡	50	152	145	− 4.6	47
Wayne Univ.‡	38	125	154	+23.2	25
West Va. Univ.*‡		66	74	+12.1	25
Wisconsin Univ.‡	94	382	342	−10.5	60
Youngstown Coll.	8	17	21	+23.5	4
Nine Southern states (Area 3, 17 schools) claim only 11% of the students					
Alabama Univ.‡	24	69	58	−15.9	14
Alabama Polytechnic Inst.‡	59	115	143	+24.4	19
University of Arkansas‡	33	66	74	+12.1	17
Clemson Agric. Coll.	35	50	64	+28.0	5
Georgia Tech.‡	110	324	229	−29.3	95
La. Polytechnic Inst.	30	43	69	+60.5	12
La. State Univ.*‡		100	182	+82.0	30
Univ. Louisville (Ky.)‡		83			6
Univ. of Mississippi	12	14	23	+64.3	8
Mississippi State Coll.	20	30	51	+70.0	3
N. C. State Coll. of Agriculture & Engr.‡	39	122	124	+1.6	28
Univ. of S. C.	40	48	73	+52.1	9
Southwestern Louisiana Inst.	24	39	43	+10.3	7
Tenn. Univ.‡	57	87	212	+143.7	19
Tenn. Polytechnic Inst.	9	23	23	none	3
Univ. of Virginia‡	25	46	56	+21.8	12
Virginia Polytechnic Inst.‡	40	128	127	− 0.8	35
Eight Western states (Area 4, 19 schools) are training 13% of the enrollment					
Univ. of Colorado‡	52	175	169	− 3.4	32
Univ. of Denver‡	8	50	44	−12.0	14
Univ. of Houston	27	95	102	+ 7.4	6
Kansas Univ.‡	13	80	98	+22.5	15
Kansas State Coll.‡	30	55	76	+38.2	17
Montana State College		51	83		16
Univ. of Nebraska*		45	38	−15.6	12
Univ. of N. M.	52	28	91	+225.0	9
N. M. Coll. of Agric. Mech. Arts	21	16	47	+193.8	4
Univ. of No. Dakota‡	23	12	38	+216.7	4
Univ. of Oklahoma‡	52	77	108	+40.3	36
Oklahoma A & M Coll.‡	46	58	122	+110.3	33
Rice Institute‡	69	154	187	+21.4	18
South Dakota Mines	14	28	28	none	6
Univ. of Texas‡	65	254	260	+ 2.4	13
Texas A & M‡	67	200	192	− 4.0	36
Texas Tech.	20	75	133	+77.3	14
Texas Coll. of Arts and Ind.	1	13	6	−53.9	3
Univ. of Tulsa	8	11	17	+54.6	

(Continued)



RCI Makes This a Seat of Strength!

For everything from chairs to switchboards . . . from fishing rods to counter tops . . . RCI produces job-tailored laminating agents and adhesives that assure remarkable strength and durability.

Moreover, RCI's awareness of industrial problems is seen in its realistic pricing policies . . . its rapid delivery of orders . . . and its reputation for supplying "know-how" to the users of the numerous quality materials it manufactures.

No wonder that Reichhold has plants on every continent . . . that it has become a *major* producer of synthetic resins for a variety of applications, as well as a manufacturer of chemical colors, phenol, glycerine, phthalic anhydride, maleic anhydride, sodium sulfate and sodium sulfite.

REICHHOLD CHEMICALS, INC.
630 Fifth Avenue, New York 20, N. Y.

Creative Chemistry . . . Your Partner in Progress

REICHHOLD

Uses of RCI Products

BRAKE LININGS: PLYOPHEN powdered phenolic resins.

CANVAS, PAPER AND GLASS CLOTH LAMINATES: PLYOPHEN cresol, phenolic and resorcinol-formaldehyde resins and varnishes; LAMINITE polyester resins.

CASTINGS: FOUNDREZ powdered phenolic resins (for the shell molding process); FOUNDREZ liquid phenolic resins and FOUNDREZ core oils (for core binders).

FURNITURE, PLYWOOD, FLOORING, HARDWOOD AND CHIPBOARD: HYDROPHEN phenolic glues; PLYACIEN protein glues; PLYAMINE urea-formaldehyde glues; PLYOPHEN phenolic and resorcinol-formaldehyde glues.

GRINDING WHEELS: PLYOPHEN powdered phenolic resins.

INSULATION: PLYOPHEN liquid phenolic resins (for binding fibre glass and rock wool batts).

MOLDING COMPOUNDS: PLYOPHEN powdered phenolic resins.

PAINTS, VARNISHES AND LACQUERS: BECKACITE (1) fumaric, (2) maleic and (3) modified phenolic resins; BECKAMINE urea-formaldehyde resins; BECKOLIN synthetic oils; BECKOPOL modified phenolic resins; BECKOSOL (1) phenolated, (2) phthalic-free, (3) rosin modified, (4) pure drying and (5) pure non-drying alkyd resins; KOPOL processed Congo copals; PENTACITE pentaerythritol resins; STYRESOL styrenated alkyd resins; SUPER-BECKACITE pure phenolic resins; SYNTHECOPAL ester gums; WALLKYD pure drying alkyd resins (for alkyd flat wall vehicles); WALLPOL vinyl-type copolymer latex emulsions (for latex flat wall coatings); RCI inorganic chemical pigment colors.

PAPER: BECKAMINE urea-formaldehyde resins (for adding wet strength, improving the wet rub of starch-clay coatings, and waterproofing starch adhesives); RCI inorganic chemical pigment colors (for paper coloring); STYRESOL styrenated alkyd resins (for paper coating).

PRINTING INKS: BECKACITE fumaric, maleic and modified phenolic resins; BECKOLIN synthetic oils; BECKOPOL modified phenolic resins; RCI inorganic chemical pigment colors.

TEXTILES: FABREZ urea-formaldehyde resins (for crush-proofing and dimensional stabilization).

RCI

there a danger of oversupply?" Many schools are lowering standards, introducing the dangers of incompetence and personal misfits. But perhaps more significant, we are all talking "shortage" because there is a real and painful shortage of engineers. But perhaps we should also give some publicity to the danger inherent in lowered standards and in possible oversupply should there be a recession four years hence.

SCHOOL	FRESHMEN	TOTAL, 1951–2	TOTAL, 1952–3	% CHANGE	DEGREES, JUNE, 1952
Five states in the far west (Area 5, 9 schools) have only 4%; this was the only section to show a dip over last year					
Univ. of California (B)*‡	——	160	74	−53.8	31
Gonzaga	8	29	27	− 6.9	7
Univ. of Idaho‡	32	54	68	+25.9	6
Oregon State Coll.‡	41	72	90	+25.0	12
Seattle Univ	15	22	39	+77.3	4
Univ. of So. Calif	19	121	76	−37.2	19
Univ. of Utah*‡	——	81	60	−25.9	10
Univ. of Washington*‡	——	121	107	−11.6	46
Washington State Coll.*‡	29	45	25	−66.7	16

Note: Data from 108 schools, 95 percent of total. Degrees are B. ChE or equivalent. In some cases, "Degrees" column includes advanced degrees. * Branch of engineering not elected until second year. Figures are estimates.
‡ Accredited, AIChE and ECPD.

FERROMANGANESE is poured at new Houston plant of Tenn-Tex as foreman J. B. Seagroves and superintendent W. A. Dillard watch. Plant is first of its kind in Southwest.

New Ferroalloys Producer

Production of ferromanganese and ferrosilicon by Tenn-Tex Alloy & Chemical Corp. brings a new industry to the Houston area. The new Tenn-Tex plant on the Houston Ship Channel will produce about 2,500 tons of these alloys a month, most going to the nearby plant of Sheffield Steel Corp.

The Tenn-Tex plant has three electric furnaces and complete facilities to produce alloys for use in steel manufacture. Two main buildings and several smaller structures house offices and production facilities. The plant occupies a 15-acre site.

While construction was under way, the plant has stockpiled manganese ore for production of ferromanganese. In full production, Tenn-Tex will import about 5,000 tons per month of manganese ore through the Port of Houston, boosting the port's traffic.

Ore will be shipped to Houston from Cuba, India, South Africa, Mexico and South American countries. Other raw materials, including limestone, coke and steel scrap, will come from Texas sources.

Location of the new plant at Houston stems principally from the Houston operation of Sheffield Steel, which requires substantial amounts of the alloys Tenn-Tex will produce. In addition to supplying Sheffield, Tenn-Tex will offer part of its output for general distribution.

Sheffield formerly got the alloys from other parts of the United States and from foreign countries.

Evaporation of Liquid Fuel Holds Clue to Better Jets

Inefficient evaporation of the liquid fuel is one of the factors causing high fuel consumption in jet engines, reports Dr. Robert D. Ingebo of the National Advisory Committee for Aeronautics.

High fuel consumption, Ingebo told chemical engineers at the recent Cleveland meeting of AIChE, results in part from inefficient evaporation of the liquid fuel. Evaporation is necessary to get combustible vapor and air mixtures.

The effect of pressure on evaporation rate of drops in gas streams under conditions simulating operation of a jet engine from sea level to altitudes of 60,000 ft. and from takeoff to supersonic flight speeds has been investigated by Ingebo. His research will be used to develop better jet engines.

Crude From Rockies Moves To Refineries in Illinois

Crude oil is now moving through the new 1,056-mi. Platte pipeline from Wyoming and Colorado to refineries at Wood River, Ill. The $60 million line, owned by the British American Oil Co. and four major U. S. oil companies, has a daily capacity of 150,000 bbl. It connects the Big Horn and Wind River Basin oilfields of northern Wyoming and the Denver-Julesburg Basin of Colorado with the large refining center at Wood River in Illinois.

Toronto Pipe Line Co., wholly owned subsidiary of British American in the United States, took part in the construction of the 20-in. line and will help to operate it. The new line enables British American to step up its production in the Steamboat Butte field in Wyoming from 2,500 to 8,000 bbl. per day.

The pipeline is expected to provide an added $200,000 of daily gross revenue to Rocky Mountain producers. Much of this money will be pumped back into further exploration and production in the surrounding area.

LDB101 NL PD= HOUSTON TEXAS 20 11:37A=
JOHN SMITH BROWN & ROOT, INC.
PITTSBURGH, PA.
JOB 2283 AHEAD OF SCHEDULE.
PLEASE EXPEDITE VESSEL NO. T47.
ADVISE SHIPPING DATE.
DYESS, SUPT.

BROWN & ROOT'S *PLUS* SERVICES COMPLETE PROJECTS FASTER . . . MORE ECONOMICALLY

In every major fabrication center of the United States, BROWN & ROOT maintains highly trained experts in procurement and expediting. They know where materials and equipment are, and how to get them to a BROWN & ROOT project *fast.*

These are only a few of the services that bring BROWN & ROOT customers back again and again. Fully equipped to do a *complete* job—from selecting the proper site for any plant or project on through designing, engineering, and finished construction—BROWN & ROOT specialists "deliver the goods" *on schedule,* ready for immediate operation.

Key men in the top ranks of industrial achievement know the value of these *plus* services. That's why the BROWN & ROOT roster of satisfied clients reads like the Who's Who in Industry.

Why not join their distinguished company if your plans call for expansion or new construction? A BROWN & ROOT representative awaits your call, at no obligation.

BROWN-BILT

BROWN & ROOT, Inc. *Engineers • Constructors*

P. O. BOX 3, HOUSTON 1, TEXAS

CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.

BONE FRAGMENTS enter impulse renderer for fat removal.

FAT is recovered as solid butter.

Shock Waves Expel Cold Fat

Sonic-frequency shock waves, transmitted through water, rupture fat and oil-bearing cells. That's the key to purer product, higher recovery, increased economy.

The principle of depth charging used for cracking enemy submarine hulls has now been applied to rupturing fat and oil-bearing animal and vegetable cells. Cold water slurries of these materials are passed through a device called an impulse renderer which is a modified hammermill. No milling takes place, however. The action of the flailing hammers produces shock impulses which are transmitted through the fluid against the individual cell walls.

Already this new technique is producing some very interesting results. Tallow recovered from tissue and bones is a bland, white fat with a total maximum moisture and impurity content of 0.02 percent. Free fatty acid content is no more than that present in the raw material. In Britain, where the process was first used, two new grades have been set up to rate this high degree of tallow purity.

Recovery of tallow is approximately 30 percent greater than can be obtained by conventional dry rendering. Solid residue from bone rendering has a protein fraction which on further processing will yield glue three times stronger than standard bone glue.

Current development work points toward the extraction of oil from fish livers and bodies. Successful trials on cod liver extraction have shown 95 percent oil recovery with twice the vitamin content of oil produced by conventional procedure.

▶ **Future Progress Charted**—In oilseed extraction the possibility is foreseen of eliminating many steps now necessary to successful extraction. Decortication, roasting, flaking, separation and recovery steps will be either bypassed or modified.

Credit for development of this process goes to a team at British Glues & Chemicals, Ltd. working under the direction of I. H. Chayen. The first commercial installation of the Chayen process started operating in Great Britain during 1949. Since then two more English plants have joined the initial unit. Now within the past few months a unit has been started at William Harris & Co., Ltd., a bone rendering and glue plant in Toronto.

Arrangements recently have been completed for the Sharples Corp., Philadelphia, to act as process sales agents in the United States. Additional development work is planned to adapt the process to American usage in the animal fat and vegetable oil industries.

▶ **Shock Treatment**—Basis for the process is that any cellular material suspended in water and submitted to a series of impulses of sufficient magnitude and frequency will suffer rupture of the cell walls. Early in the process development, impulses having supersonic frequency were found too violent for good results; undue deterioration of cell structure was produced with attendant unbreakable emulsions. Since that time all work has centered on impulse frequencies well within the sonic range.

Modification of a hammermill to an impulse renderer has been primarily a matter of shortening hammer length and rounding the tips. This leaves space in the mill for the free passage of slurry between the hammer tips and the mill wall.

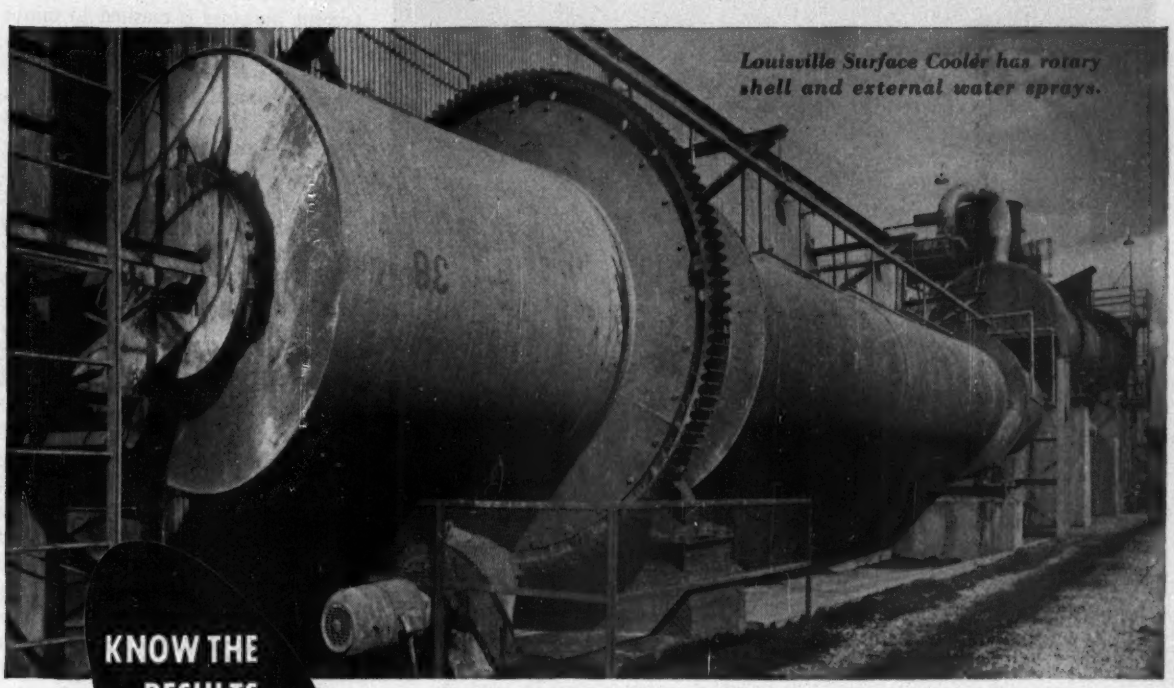
Streams of water and fat-bearing material merge at the top of the renderer, pass down through the wide space between hammer tips and outer wall. Discharge is through a grating on the bottom—thus the renderer is only full on the side where the hammers swing downward.

As the rotor turns the individual hammers flail the surface of the descending slurry, imparting shock waves to the fluid medium. There are only a minimum number of impacts between hammers and solids—actual cell wall rupture is due entirely to the impulses transmitted through the water.

Each type of oil-bearing material requires a different combination of rendering conditions. Among these are consistency of entering slurry,

Louisville for CREATIVE COOLING ENGINEERING

Louisville Cooler does satisfactory job at low cost for nationally known chemical manufacturer . . .



Louisville Surface Cooler has rotary shell and external water sprays.

KNOW THE RESULTS before you buy!

. . . cooling lumpy calcined material from 1800° Fahr. to 150° Fahr. for further processing. Gentle mechanical handling required to minimize decrepitation.

Each Louisville cooler is "*job-fitted*" to your special problem—to make your cooling operations effective—to assure dependability of performance that will make the cooler operation pay.

Call in a Louisville engineer for a complete cooling survey. Based on his experience he will recommend one of the three standard Louisville types, a modification, or an entirely new design. *The performance will be pre-determined.* You'll know the results before you buy . . . and the results *must* be better! Write for complete information today.

3 types of Louisville Coolers

- Surface Cooler
- Water Tube Cooler
- Atmospheric Cooler

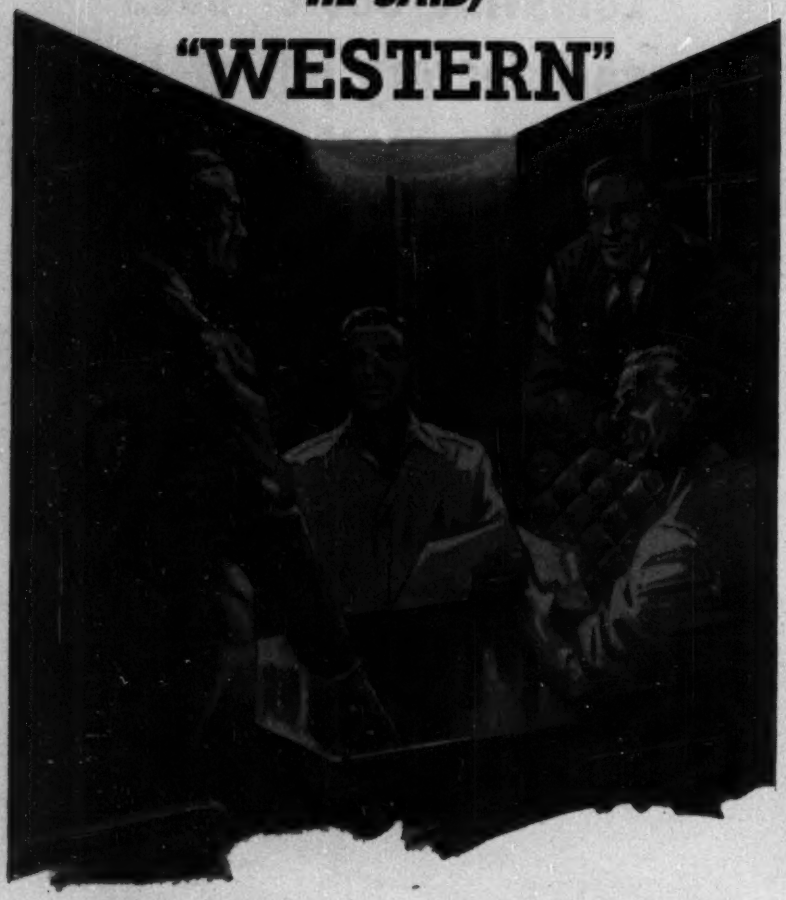
Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dryers, Dewaterers, Towers, Tanks, Bins, Filters, Kilns, Pressure Vessels

PROCESS EQUIPMENT DIVISION GENERAL AMERICAN TRADE MARK

Louisville Drying Machinery Unit
Over 50 years of creative drying engineering
GENERAL AMERICAN TRANSPORTATION CORPORATION

Dryer Sales Office: Hoffman Bldg., 139 So. Fourth Street Louisville 2, Kentucky
General Offices: 135 South La Salle Street, Chicago 90, Illinois
Offices in all principal cities
In Canada: Canadian Locomotive Company, Ltd. Kingston, Ontario

WHEN THEY SAID HEAT EXCHANGERS HE SAID, "WESTERN"



He started as a salesman-engineer for a small Chemical Processing company . . . today he heads a multi-million dollar corporation. His opinion is respected not only for the position he holds, but because his climb up the ladder was built on a reputation for good judgment! In his early pioneering days he got acquainted with the people of Western Supply Company . . . found plenty of opportunity to call on their experience and advice in heat transfer problems . . . grew to have trust in the integrity of their design, construction and delivery on all heat exchanger orders.

And at that all-important plans session . . . when they said "heat exchangers" . . . he said "WESTERN".

Chapman Valves

Taylor Fittings and Flanges

Crane Valves

Nordstrom Valves

WESTERN HEAT EXCHANGERS

Manufactured by WESTERN SUPPLY COMPANY

P.O. BOX 1000 TULSA, OKLAHOMA

linear speed at hammer tips, impulse frequency and retention time. Bone rendering is performed at 1,800 impulses per sec. with a tip speed of 13,000 ft. per min. using one part by weight bone suspended in seven parts of water.

▶**Bone Rendering**—The Chayen process at William Harris & Co. consists of three major stages: Impulse rendering, separation of fat and water from solid residue, and final separation of fat and water phases.

Five thousand lb. per hr. of raw bone containing approximately 30 percent moisture is crushed to minus 4 in. fragments. This material then passes to a chopper which severs the stringy material to make a uniform feed. The chopped bone and cold water are fed through the impulse renderer where the fat is literally blasted from the bone cells. Slurry retention time inside the renderer is less than one second.

Discharge from the renderer drops into the first separator tank. Here the mass of bone and protein settles out while fat and water overflow to the first fat collecting tank. This overflow, carrying 85 percent of the fat ultimately recovered, constitutes feed to the primary fat recovery system.

▶**Residue Removal**—Bone settling in the first separator tank is elevated by a screw conveyor, washed with cold water and dumped into a second separator tank maintained at 195 deg. F. During a two-minute retention time in this vessel the protein in the residue is coagulated, releasing residual fat.

The mixture of bone and protein is again removed by a screw conveyor and subjected to a hot water wash to flush away the last traces of fatty particles. Discharge from the screw conveyor can pass through either squeeze rolls and thence to a dryer or directly into the glue manufacturing process. Dried residue with 35 percent protein and 45 percent tricalcium phosphate finds use as either a stock feed supplement or as a fertilizer.

▶**Fat Recovery**—Overflow from the second separator tank goes to the secondary fat recovery system. This separate operation is designed to keep hot water out of the primary circuit.

Primary fat rises to the top of the first fat collecting tank as a heavy froth made up of small individual fat

anyway you LOOK *at it!*

PETRO - CHEM ISO - FLOW FURNACES

are most efficient by any comparison!

maximum fuel efficiency

low maintenance

low pressure drop

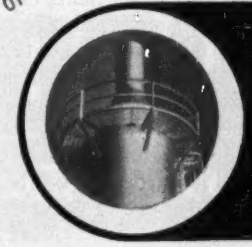
minimum ground space

better heat distribution

simplicity of design and construction

The generic design of ISO-FLOW heaters, including the reradiating cone, gives excellent heat distribution, eliminating localized overheating. Further, all walls are protected by tubes which create low wall temperatures. The walls have high insulating characteristics which create minimum outside shell temperatures, and, hence, extremely low radiation. With a radiation loss of under 2%, more heat is absorbed by the fluid being heated, resulting in higher efficiency for any type of Iso-Flow design. Since Petro-Chem has a wide variety of convection sections, all heaters can be designed for optimum fuel efficiency or for maximum fuel efficiency where the price of fuel and other economic considerations justify.

More than 1100 are in operation throughout the world in the petroleum, chemical and allied industries . . . for all processes and for any duty, pressure, temperature and efficiency . . . and all Petro-Chem Iso-Flow Furnaces are pre-eminently satisfactory.



PETRO-CHEM ISO-FLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

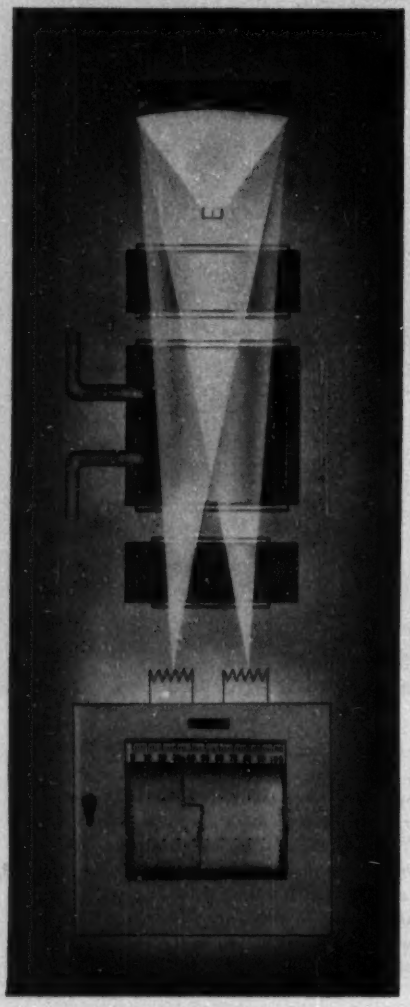
PETRO-CHEM DEVELOPMENT CO., INCORPORATED

122 EAST 42ND STREET, NEW YORK 17, N. Y.

Representatives: Bethlehem Supply, Tulsa and Houston · Flagg, Brackett & Durgin, Boston · D. D. Foster, Pittsburgh · Faville-Levally, Chicago · Lester Oberholtz, California · Gordon D. Hardin, Louisville, Kentucky

END POINT ANALYSIS

ACCURATE - AUTOMATIC - CONTINUOUS



for

$$\frac{CH \equiv CH}{\begin{matrix} CH_2{=}CHCN \\ CH_2{=}CHCl \end{matrix}}$$

$$\frac{CH_2{=}CH_2}{\begin{matrix} CH_2OH - CH_2OH \\ C_2H_5OH \end{matrix}}$$

with the *Baird Associates* PLANT STREAM ANALYZER

- The decisive factor in the economic success of a process is product quality and yield.
- End-point analysis for concentration variations is a reliable index of product quality and yield.
- Through end-point control, the results of such analyses can be automatically and continuously used to correct the process variables.

- For these reasons, continuous end-point analysis and its control application are of major significance to the process engineer.
- The *Baird Associates* Plant Stream Analyzer is specifically designed for continuous end-point analysis and control.

WRITE TODAY FOR BULLETIN 36

PROCESS CONTROLS

a division of Baird Associates, Inc.

411 UNIVERSITY ROAD CAMBRIDGE 38, MASSACHUSETTS

particles. A major portion of the water in this tank is recycled back to the impulse renderer. The fatty scum is discharged to a feed tank and then to a 48-in. imperforate-basket batch centrifugal operating at 600 g. Suspended protein particles are retained in the basket while the fat butter and water overflow and pass to a second fat collecting tank.

Fat butter on top of the second collecting tank is continuously paddle-skimmed into a heat exchanger where it is melted and fed to 36-in. imperforate-basket batch centrifugal operating at 1,000 g. This machine is fitted with a ring dam to permit discharging the liquid fat and water as two separate streams.

Liquid fat from this unit is heated to 158 deg. F. and polished in a high-speed centrifuge to a final combined moisture and impurity content of 0.02 percent. Total elapsed time from raw material to finished product is less than 5 min.

A portion of the feed to the final polishing centrifuge consists of effluent or overflow from the second separator tank and a bleed from the second fat collecting tank. This combined stream is first centrifuged in a nozzle-discharge disk-bowl machine to separate water and impurities from the fat phase. Discharge from this centrifuge joins the main stream entering the final polishing machine.

Initial dry bone with a fat content of 15 percent will be reduced by the Chayen process to a fat content of 2 percent. Actually, fat remaining in the bone exists as a lime soap which is not desired in the final fat product.

Power requirements for this rendering process are 150 kwh. for a 5,000 lb. unit as against 75 kwh. for a comparable dry rendering plant. However, fuel consumption is only one-third as much and fuel bulks much larger in normal rendering expense than does power. Two men can operate a 5,000 lb. per hr. plant.

Sharples engineers installing similar processes in the States expect to make some equipment changes in the present flow sheet. Continuous solid-bowl centrifugals will be used for the dewatering and washing of bone residue and for removing protein from the first collecting tank overflow. The final polishing step will be carried out by a high-speed Super-Centrifuge.

(*News continued*)

ANYONE CAN BUILD A PNEUMATIC CONVEYOR...

It's true! Anyone can build a pneumatic conveyor—*of some sort*. Of course, it won't be efficient . . . it won't streamline your materials handling operations . . . and it won't reduce your handling costs — but it will be a pneumatic conveyor.

However, in solving your bulk materials handling problems, you will want to investigate Dracco Airstream Conveyors. Each high-efficiency, automatic Airstream Conveying system is:

1. Designed for a cost-saving solution to your specific handling problem.
2. Designed accurately by engineers having many years of experience exclusively in this field.
3. Constructed of quality materials for long, trouble-free service.

If you are handling bulk granular or powdered materials, remember that Dracco Airstream Conveyors possess unique advantages over any other type of system.

DRACCO CORPORATION
Harvard Ave. and E. 116th St., Cleveland 5, Ohio

Bulletin 529 presents complete, technical information on handling bulk materials with Dracco Airstream Conveyors. Write Dept. C-9, Cleveland 5, Ohio, for your copy.

DRACCO *Performance Proved*

Airstream **CONVEYORS · DUST CONTROL EQUIPMENT**

FOR SKILLED PERFORMANCE BY UNSKILLED OPERATORS

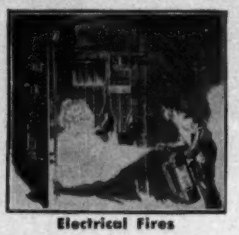
INDOORS and OUTDOORS YOUR *BEST* PROTECTION FOR FLAMMABLE LIQUID, GAS AND ELECTRICAL FIRES

ANSUL DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT

Textile Lint Fires

Flammable Liquid Fires

Gas Fires


Electrical Fires

HAND PORTABLES
•
WHEELED PORTABLES
•
STATIONARY EXTINGUISHERS AND PIPED SYSTEMS
•
TRUCK MOUNTS, TRAILERS AND SELF-PROPELLED UNITS
•

Ansul Dry Chemical Fire Extinguishing Equipment has world-wide recognition as preferred protection for flammable liquid, gas and electrical hazards. Yet a surprising number of Ansul Extinguishers are used to protect textile mills and paper mills against serious loss from surface fires such as occur in textile lint and combustible paper dust. The textile and paper making industries rely on Ansul Extinguishers for quick control of dangerous flash fires in class "A" (ordinary combustible) materials. Any remaining embers are quenched with small quantities of water, thereby keeping water damage at a minimum.

Surface fires in textile lint and combustible dusts spread rapidly. They need quick control. If you have serious lint or dust hazards, talk with your Ansul representative. He may have suggestions to reduce fire damage and lost production time.

ANSUL MODEL 20-B

Send for File No. 934. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped systems and Ansul 2000 lb. Stationary Units.

ANSUL CHEMICAL COMPANY
Fire Extinguisher Division
MARINETTE • WISCONSIN

OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES
ALSO MANUFACTURERS OF INDUSTRIAL CHEMICALS, REFRIGERANTS AND REFRIGERATION PRODUCTS

Ruhrgas Process Gasifies Pulverized Coal in Cyclone

A new process for gasifying pulverized coal, developed by the Ruhrgas Co. of Essen, is expected to meet the increased demand for coke-oven gas in Germany. Ready for commercial use, its results exceed those of conventional gas producers gasifying coke.

Gas consumption in Germany has increased rapidly during the past 25 years. Practically no natural gas is available, and gas made from residual oils is insignificant. So all gas has to be manufactured from coal.

A sharp increase in consumption was made possible by the distribution of coke-oven gas from the two main coal-producing areas, the Ruhr and the Saar. Much of the coke-oven gas produced in the Ruhr is piped by the Ruhrgas Co. over long distances to industry, as well as to local gas companies.

Net gas production in Western Germany totaled 338 billion cubic feet in 1950. This included 266 billion cubic feet of coke-oven gas, representing 79 percent of the total gas production. Only 21 percent was manufactured by local gas works. The Ruhrgas Co. supplied 115 billion cubic feet in 1950 and a larger amount in 1951. Total length of the pipelines is about 1,200 mi.

At present, the supply is not sufficient to meet the demand for gas in Germany. All surplus gas from coke-oven plants is disposed of, and an increase in gas production by increasing coke production can hardly be expected because of the limited coking coal and the lack of a market for more coke. Additional gas can be produced only by methods that do not require coking coal and that do not produce additional lump coke.

Faced with this situation, Ruhrgas started research in 1936. World War II interrupted the work, but it was resumed in 1947.

The research is pointed toward making producer gas for use as a heating gas, synthesis gas for chemical uses, and high-Btu. gas (490 Btu. per cu. ft.) for pipeline distribution. Since coke-oven gas is the conventional type distributed by pipeline and distances are shorter than in the United States, a gas approaching the heating value of coke-oven gas is termed a "high-Btu. gas," and its distribution

is considered economical. Conversion of coal into gas requires high efficiencies and large capacity per unit.

Major problem of the German gas industry is to release for pipeline distribution the large amounts of coke-oven gas still used for heating only. To do this, it is necessary to gasify low-grade fuels, such as high-ash fine coals and dust, which need no preparation except possibly pulverization. Pulverized coal gasification is one way to use bituminous coal of all ranks and types, without dependence on the coking propensity or other characteristics of coal.

By the new process, pulverized coal is gasified in a vortex or cyclone chamber. The high heat release makes it possible to operate the reactor with liquid-slag removal, with preheating of the blast air up to 1,100 deg. F.

Tapping of the slag in the liquid phase is an essential feature of the process, since about 20 percent of the fuel is recycled to maintain adequate carbon concentration in the reactor. Because of the efficient slag removal, the recirculated fuel does not carry much higher ash content than the raw fuel. The process enables a complete consumption of the fuel.

Thus far, the process has been fully tested with pulverized lignite, lignite char and bituminous coal and works successfully with these fuels.

Cat Reformer Will Double Output of Aviation Gas

A catalytic reforming unit for the manufacture of high-octane aviation gasoline will be built next year at the Port Arthur, Tex., refinery of Gulf Oil Corp. at a cost of more than $12 million. Construction is expected to be under way during the first quarter of 1953.

The new catalytic reformer, which will be one of the largest in the country for the production of high-octane gasoline of military grade, will double Gulf's output of aviation gasoline at Port Arthur.

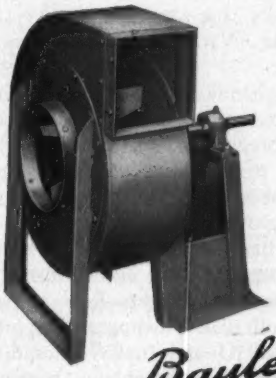
Certificates of necessity for the project have been issued as follows: $8,034,425 with a 65 percent writeoff; $2,111,440 with a 50 percent writeoff; and $1,965,135 with 90 percent.

A new ethylene unit, under construction for more than a year, has just gone on stream at Port Arthur. The huge $8 million plant will produce 80 million pounds per year of ethylene.

Bayley Provides The Solution . . .

. . . For Your AIR HANDLING Problems

WHETHER you require the removal of fumes, vapors, refuse —conveying of materials—air cleaning—or any other phase of plant or laboratory air handling, BAYLEY engineers may be relied upon to help you achieve the desired results. And BAYLEY Air Handling Equipment, properly designed and selected, will deliver trouble-free, ever-dependable service year after year. This fact is proved by the effective performance of BAYLEY Equipment in a wide field of industrial and technical applications.



Type "EX" Fan

- CENTRIFUGAL FANS
- AIR WASHERS
- BLAST HEATERS

CHECK THE COUPON, below, for data and bulletins covering BAYLEY Air Handling Equipment of interest to you:

Bayley BLOWER COMPANY
MILWAUKEE
Engineered Air Handling Equipment

BAYLEY BLOWER CO.
1823 S. 66th St., Milwaukee 14, Wis.

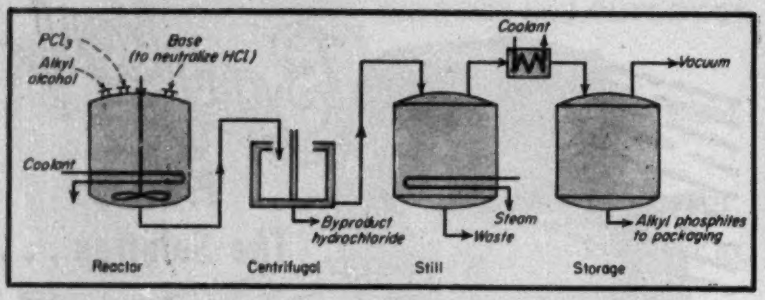
Please send illustrated bulletins covering Bayley Equipment for:

☐ Industrial Exhaust ☐ Pneumatic Conveying
☐ Process Conditioning ☐ High Temperature

FIRM .....

Address .....

.....



REACTOR is key vessel in this general process for producing alkyl phosphites.

Alkyl Phosphites Now Set to Go

Virginia-Carolina starts up its semi-commercial unit to turn out dialkyl and trialkyl phosphites. They promise to open up new and bigger fields for the phospho-organics.

Alkyl phosphites have long been known as versatile building blocks for phosphorus-containing organic chemicals. Now they show more promise than ever in that vast and expanding field.

Growing interest in the entire field is illustrated—perhaps underscored—by Virginia-Carolina Chemical Corp.'s recent expansion in the alkyl phosphite business. That company, backed up by its new semi-commercial plant facilities at Charleston, S. C., is now actively pushing the most complete line of alkyl phosphites yet offered to industry*.

Other producers, too, are increasingly active in the field. Victor Chemical Works now offers dibutyl, diethyl and dioctyl hydrogen phosphites in semi-commercial quantities from its Chicago Heights, Ill., plant. Monsanto offers triethyl phosphite, and Du Pont has produced tributyl phosphite for several years at Carneys Point, N. J. The Chemical Corps also ranks as a major producer.

Although the total non-military consumption of alkyl phosphites hasn't quite yet hit the million-pound-a-year mark, uses are growing fast. A number of firms (estimated at close to 100) are looking into them. Virginia-Carolina and Victor are already making multi-ton shipments of some of their new products.

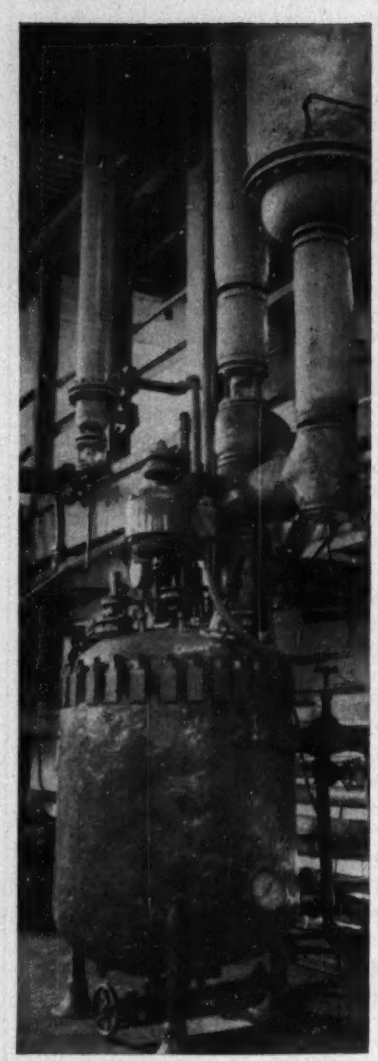
▶**Going Up**—What the non-military market for alkyl phosphites might be by 1960 is anybody's guess right now. One source places it at close to 6,000,000 lb. This isn't far behind the 10-million-pound niche that the sister alkyl phosphates now occupy. (Tricresyl phosphate, leader of all the phospho-organics, is already at the 15-million-pound mark.)

Part of this new-found interest in phosphites stems from the fact that the alkyl esters of phosphorous acid show a greater variety of useful chemical reactions than any other class of phospho-organic chemicals. On top of this the entire field of phospho-organics has grown rapidly since World War II—with no letup in sight.

Big handicap of the alkyl phosphites (in contrast to the organic phosphates) has been their relative high prices; until recently they were made in experimental quantities only. But as output grows, prices will tend to dip. And that's when the alkyl phosphites will begin to come into their own.

▶**Process Highlights**—Raw materials for both dialkyl hydrogen phosphites—$(RO)_2PHO$—and trialkyl phosphites—$(RO)_3P$—are phosphorus trichloride and alkyl alcohols. For practical purposes, theoretical quantities of raw materials are used.

At Virginia-Carolina's Charleston plant, these are charged into an agitated glass-lined reactor (see cut). Glass is used because of the corrosive action of PCl_3 and the byproduct HCl; the phosphites themselves are not particularly corrosive. Stainless steel is used for most of the other equipment.



REACTOR used in Virginia-Carolina's semi-commercial unit at Charleston, S. C.

The reactions between PCl_3 and alkyl alcohols are highly exothermic and rapid. Refrigerants are used for cooling, and the controlling factor on the time of reaction is the speed of heat removal*.

▶**Di vs. Tri**—When making dialkyl hydrogen phosphites, the byproduct hydrogen chloride is not removed until the reaction is essentially completed. Alkyl chloride is also formed as a byproduct.

$$3\ ROH + PCl_3 \rightarrow (RO)_2PHO + RCl + 2\ HCl$$

For production of trialkyl phosphites, the HCl must be removed by

* Triethyl, tri-2-propyl, tributyl, trihexyl, triisooctyl, tri-2-ethylhexyl, dimethyl, diethyl, dibutyl and di-2-ethyl hexyl hydrogen phosphites. Four of these (dimethyl hydrogen phosphite, tri-2-propyl, trihexyl and triisooctyl) are new commercial products.

* More process details are not available at this time. Virginia-Carolina has developed several new process features, including a novel method for preparing the trialkyl phosphites.

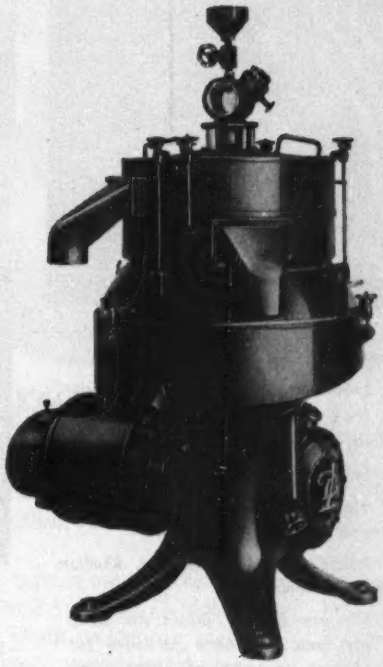
NO TIME FOR INTERRUPTION!

It always pays to keep the objective clearly in view! In processing, for example, the objective is to achieve straight-line production, with as few interruptions as possible. Centrifugal force can often help achieve this goal.

De Laval centrifuges can speed up many processes, for in a matter of minutes they make separations that with gravity or inefficient filtering once took hours. Such continuous centrifuging takes three basic forms:

1. The continuous separation of two liquids
2. The continuous clarification of one or two liquids
3. The continuous separation of two liquids plus the continuous removal of solids from one or both liquids

Each problem is different, but with a background of some 75 years of experience with centrifugal machines, De Laval engineers may well have solved a problem like yours. Why not ask?



De Laval

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

for [illegible]

PLATINUM

GOLD AND SILVER

for the chemical + metallurgical industries

Electrodes, Stills, Retorts and other Special Process Equipment to order.

Laboratory Wares of all description.

Sheet, Wire, Tubing, Gauze and Fine Foils.

Salts and Solutions.

Platinum Metals Catalysts — Concentrated forms and on carriers.

Palladium, Iridium, Osmium, Rhodium and Ruthenium.

We pay highest prices for scrap platinum and have facilities for prompt recovery of spent platinum and palladium catalysts.

Sheet, Foil and Ribbin, pure and in alloy. Seamless Tubing. Laboratory Apparatus and Process Equipment.

Karat Golds. Fine Gold Anodes.

Fine, Sterling and Coin. Sheet, Wire, Circles and Foil.

Fine Silver Anodes. Rolled, Cast or in Shot forms.

Silver Brazing Alloys and Fluxes for every industrial requirement.

WE INVITE YOUR INQUIRIES AND WILL SEND ON REQUEST FOLDERS:
C-20, *"Platinum, Gold and Silver for Science, Industry and the Arts"*
C-21, *"Platinum and Palladium Catalysts"*.

THE AMERICAN PLATINUM WORKS

PRECIOUS METALS SINCE 1875

231 NEW JERSEY R.R. AVE., NEWARK 5, N. J.

neutralization as soon as it is formed (otherwise the dialkyl compounds result):

$$3\ ROH + PCl_3 + 3\ Base \rightarrow (RO)_3P + 3\ Base\cdot HCl$$

After completion of the primary reaction the byproduct hydrochloride salt is centrifuged off and the products distilled. Both classes of phosphites are colorless liquids with characteristic mild or sweet odors. All except dimethyl and diethyl hydrogen phosphites are lighter than water.

Trialkyl phosphites are rather unstable when exposed to air and moisture; they must be handled carefully during processing to prevent oxidation and hydrolysis.

Virginia-Carolina has a purity specification of above 85 percent for trialkyl phosphites, but rigid process control now enables them to turn out these compounds with purities as high as 98 percent. These exceptionally high purities are naturally bringing about wider acceptance. The dialkyl compounds, too, run above 95 percent purity.

▶**New Worlds to Conquer**—Alkyl phosphites show promise—and are under active investigation—in many new fields: As intermediates in the synthesis of a host of phospho-organic compounds; as additives to lubricating oils (corrosion inhibitors, stabilizers and anti-oxidants); for preparing flame-resistant and flame-proofing compounds; in extreme-pressure lubricants to improve such factors as viscosity, film strength and load-carrying capacity; as stabilizers, plasticizers, specialty solvents, textile finishing agents, anti-foams and anti-statics.

Most important new use for the trialkyl phosphites: Stabilizers for vinyl resins and cellulosics. Their ability to react with hydrohalide acids to form non-acidic products makes them ideal for this purpose. Good thermal stability—coupled with their slow oxygen uptake—enhances their usefulness. In some respects trialkyl phosphite stabilizers have a clear edge over the aryl phosphites.

Government men and a large number of petroleum companies are following up the possibilities of alkyl phosphites as oil additives to stabilize and give desirable extreme-pressure properties to lubricants.

Here they are effective over a wide temperature range to control oxidation

and cut down alloy bearing corrosion. The higher phosphites prevent oil-film rupture in compound lubricants—thus have the edge over straight mineral oils in permitting higher loads without excessive wear.

▶ **For Phospho-Organics**—Alkyl phosphites provide an easy path for introducing the phosphorus atom into both simple and complex organic molecules. For the long pull, this is the most exciting prospect.

In general, the dialkyl phosphites look more promising as reactants and have a slight edge cost-wise. The trialkyls will probably pan out more successfully for developing end uses other than as chemical intermediates.

Alkyl phosphites can be used to prepare phosphates, phosphonates, diphosphonates, thiophosphates, phosphonic acids, pyrophosphites, hypophosphates, alkyl halophosphates and other organic derivatives. Some of these, in turn, may very well pave the way for entirely new products in such fields as medicinals, dyes, pesticides, flame-proofing agents and plastics.

Particularly promising right now are their possibilities in flame-resistant textiles, plastics and other materials. The flame-proofing of textiles, for example, will almost certainly expand rapidly.

And looking even further ahead, Director of Research William P. Boyer of Virginia-Carolina thinks it quite conceivable that "the future holds a place for an organic phosphorus fiber . . . superior in its flame resistance properties."

As one consultant points out, as soon as prices are more competitive the alkyl phosphites might find their largest outlet in fire-retardant plastics. Victor Chemical's Phoresin is a leading example of the recent move in that direction.

▶ **Hardly Scratched**—On this point most researchers in the phosphorus business agree: The vast and inviting field of the phospho-organics has hardly been scratched yet. But the alkyl phosphites are all set to play their important part as versatile building blocks.

New Distilling Column Is Part of Shell's Expansion

A new crude distillation column, just put on stream at the Martinez, Calif., refinery of Shell Oil Co., will increase total capacity by 10,000 bbl. a day. The new unit, together with

an ACCO product

Positive Flow Control

● For special hookups such as well head assemblies and gauge panels, the R-P&C Bar Stock Valve has no equal. It is a fine throttling valve that positively controls the flow.

Male and female end type is made of carbon or chrome stainless in ¼" and ½" sizes, in globe and angle types. Other bar stock valves are made of bronze, stainless, or carbon and stainless steel in sizes ⅛" to 1". High pressure and temperature ranges.

See your R-P&C distributor or write nearest R-P&C district office for information on precision turned Bar Stock Valves.

ACCO

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves

This lightweight, rigid block insulation, effective up to 1700° F. eliminates the need for separate high and low temperature materials. Its low thermal conductivity helps maintain proper operating temperatures in steam boilers, refinery towers, ovens, chemical treating tanks and other hot equipment.

B-H Mono-Block is stable under severe heat and moisture conditions. And finished with B-H Powerhouse Cement (which also insulates) it provides long lasting insulation with permanent high efficiency. When heat losses have you worried, get in touch with B-H Engineered Insulation Service. No obligation at all.

Baldwin-Hill

Clip on signed letterhead and mail

TEAR OUT

BALDWIN-HILL COMPANY, 401 Breunig Ave., Trenton 2, N. J.

Please send complete information on

- ☐ MONO-BLOCK... Rigid, felted black rockwool block—for high and low temperature use
- ☐ POWERHOUSE CEMENT... High adhesion, black rockwool insulating-finishing cement
- ☐ BLANKETS... Metal-reinforced, flexible, felted black rockwool insulation
- ☐ NO. 1 INSULATING CEMENT... All-purpose, rust-inhibiting plastic cement

auxiliary pumps and heat exchangers, cost Shell more than $250,000. It boosts the refinery's capacity to about 70,000 bbl. per day.

The column, weighing more than 50 tons, is an integral part of a distillation plant that separates crude petroleum stocks into gasoline components, solvents, kerosenes, stove oils and cracking stocks.

This Martinez distillation column is the initial project in Shell's program to increase West Coast refining capacity, and is part of a $100 million nationwide expansion that will eventually add about 4 million gallons daily to the nation's petroleum output.

In addition to the distilling column, a new $150,000 acid-treating unit has been installed. The unit treats materials from the cracking plants before their final distillation into cracked gasoline products.

Humble to Make Para Xylene In New Unit at Baytown

Humble Oil & Refining Co. plans to construct a para xylene crystallization unit and a catalytic light ends unit at its Baytown, Tex., refinery.

In the crystallization unit, para xylene will be manufactured. It is one of the principal ingredients used in the production of the synthetic fiber Dacron. Construction is just getting under way, and the crystallization unit won't be completed until May 1953.

With equipment in the new catalytic light ends plant, the second of its kind at Baytown, light hydrocarbons from two catalytic cracking units will be fractionated into raw stocks for the manufacture of synthetic rubber, aviation gasoline, liquefied petroleum gas and motor gasoline. Construction starts in the first quarter of this year, and the unit will be completed about the middle of 1954.

The new effluent filtration unit at the Baytown refinery is now operating. It separates chemicals from spent wastes, then purifies, filters and reoxidizes the remaining water before it joins the treated effluent from the other parts of the refinery.

Southern California Plant Manufacturing Propellants

Grand Central Aircraft Co. of Glendale, Calif., and Tucson, Ariz., has now disclosed the nature of the oper-

Why your machinery and motors last longer with LINK-BELT Fluid Drive's constant

CUSHION ACTION

IF YOUR MACHINE loads are of the high inertia, repetitive shock or high starting torque type, Link-Belt's Fluid Drives can save you money.

Constant CUSHION ACTION gives you the shock absorption and overload protection you need. More—because shock load service factors can be disregarded, you can use power transmission equipment of lower horsepower.

Check the three curves below. They demonstrate three exclusive advantages of CUSHION ACTION. And for more detailed information, write for Book 2485. In it you'll find all the facts on five types of Link-Belt Fluid Drives —Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive.

Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.

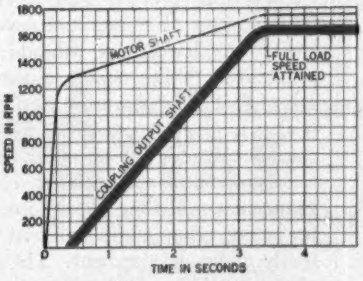
LINK-BELT

FLUID DRIVES

12,654

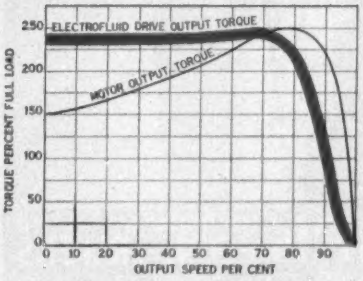
Here's proof

that LINK-BELT CUSHION ACTION offers you real savings . . .



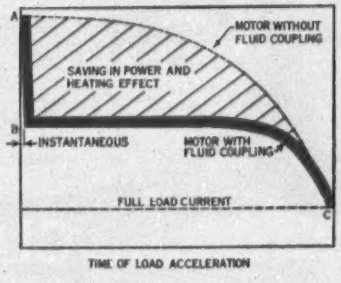
Smooth acceleration

Typical motor and coupling acceleration curves for a high-inertia load show how CUSHION ACTION smoothly and gradually accelerates the load, saving wear and tear on vital equipment.



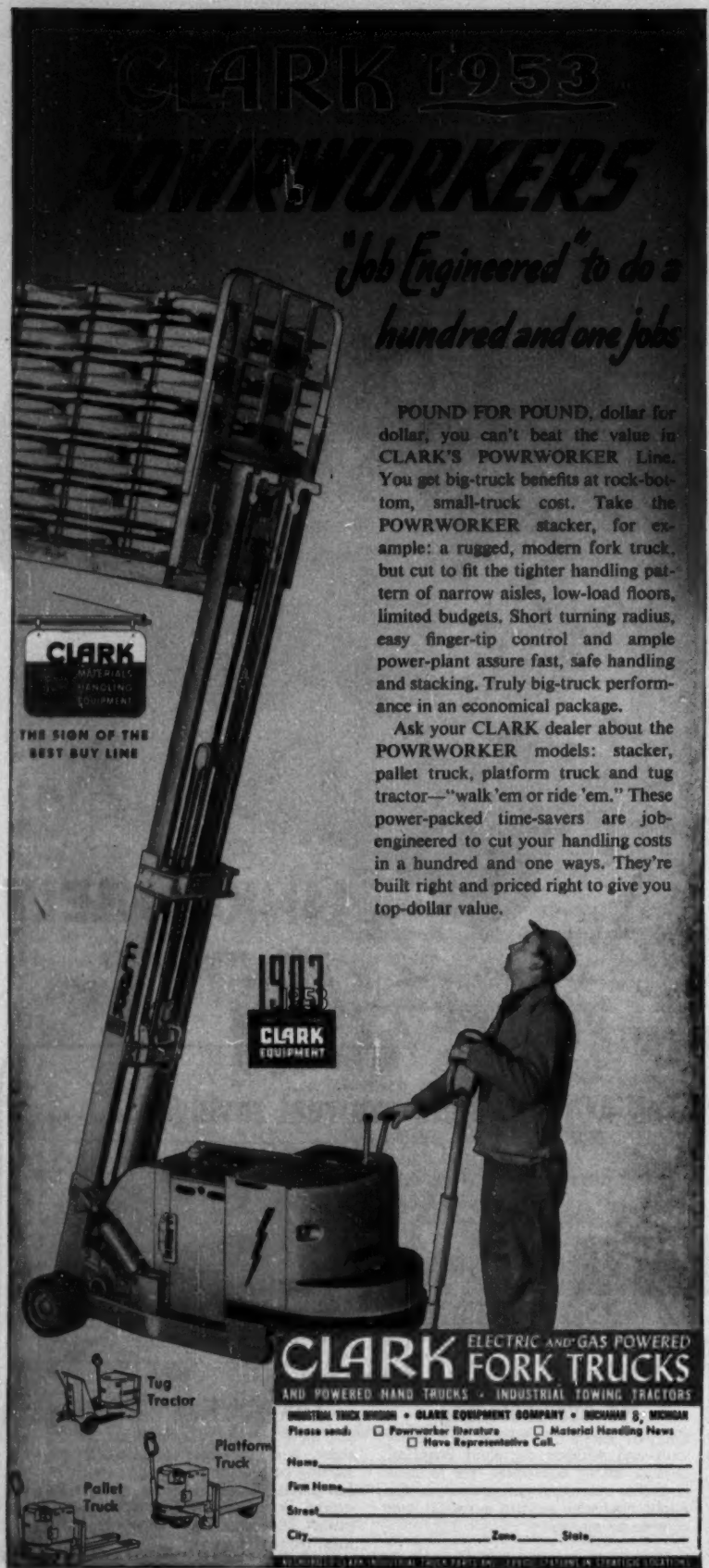
No overmotoring

Compare the output torque of a motor with and without the fluid coupling. Because motor accelerates free of load, it reaches maximum pull-out torque that might otherwise require a special type of oversize motor.



Low starting current

As these current consumption curves show, with the fluid coupling, motor starting current drops instantaneously to less than half the starting current required by a motor without fluid coupling. Difference represents power savings, reduced heating.


CLARK 1953
POWRWORKERS
"Job Engineered" to do a hundred and one jobs
POUND FOR POUND, dollar for dollar, you can't beat the value in CLARK'S POWRWORKER Line. You get big-truck benefits at rock-bottom, small-truck cost. Take the POWRWORKER stacker, for example: a rugged, modern fork truck, but cut to fit the tighter handling pattern of narrow aisles, low-load floors, limited budgets. Short turning radius, easy finger-tip control and ample power-plant assure fast, safe handling and stacking. Truly big-truck performance in an economical package.
Ask your CLARK dealer about the POWRWORKER models: stacker, pallet truck, platform truck and tug tractor—"walk 'em or ride 'em." These power-packed time-savers are job-engineered to cut your handling costs in a hundred and one ways. They're built right and priced right to give you top-dollar value.
CLARK MATERIALS HANDLING EQUIPMENT
THE SIGN OF THE BEST BUY LINE
1903 1953
CLARK EQUIPMENT
Tug Tractor
Platform Truck
Pallet Truck
CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS
INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BUCHANAN 8, MICHIGAN
Please send: ☐ Powrworker literature ☐ Material Handling News
☐ Have Representative Call.
Name
Firm Name
Street
City Zone State

ations of its propellant division at Pacoima, Calif., hitherto a closely guarded secret.

The project entails mixing, processing, testing, shipping and storing propellant charges under contract with U. S. Army Ordnance. It is one of three such projects in Southern California; the others are at California Institute of Technology, Jet Propulsion Laboratory at Pasadena and Aerojet Engineering Co. of Azusa.

Grand Central's new division is directed by physicist Charles E. Bartley, formerly with California Institute of Technology. The staff includes 32 persons, mostly chemical engineers and mechanical engineers.

The plant, now in full production and making deliveries, occupies five acres. In addition to an administrative and engineering unit, there is a modern processing plant with milling, mixing and other facilities.

General Aniline Halves Polyvinylpyrrolidone Price

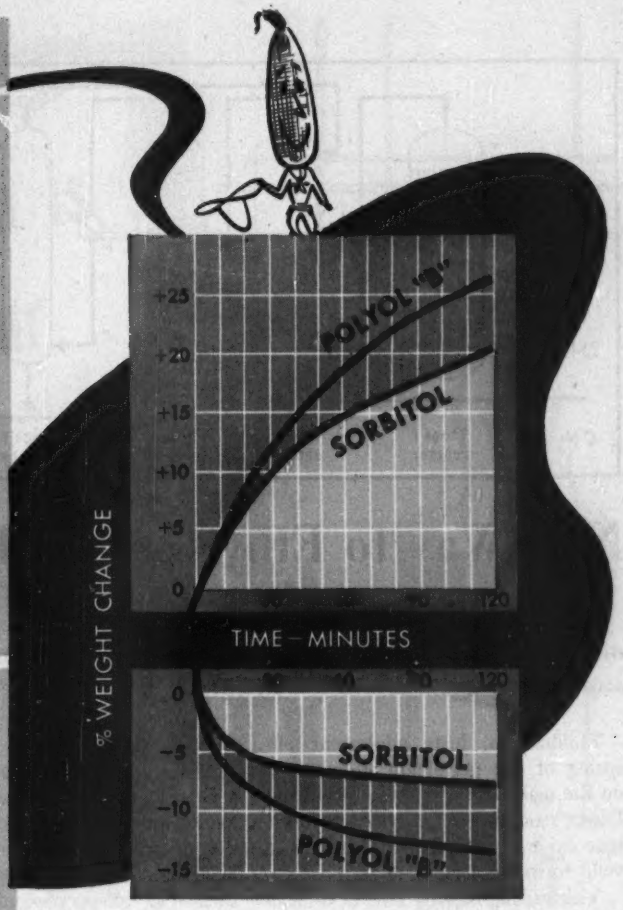
Price cuts ranging up to 50 percent on polyvinylpyrrolidone have been made by General Aniline & Film Corp., sole producer in the Western Hemisphere. The pharmaceutical grade has been cut from $12 to $6 per lb. This includes the blood plasma extender grade of PVP, which meets specifications of the National Research Council and the Federal Civil Defense Administration for PVP to be stockpiled for emergency use as a plasma extender.

The non-pharmaceutical grade has been reduced from $6 to $3 per lb. Both of the new prices apply to 100-lb. lots or greater.

"We feel," says Dr. Jesse Werner, GAF director of commercial development, "this lower price will add new possibilities to the rapidly expanding uses of PVP. The pharmaceutical grade is already of great interest as a blood plasma extender, as a binder for a variety of tablets, as a retardant vehicle, in procaine-penicillin suspensions, and for many other additional uses currently under development. The non-pharmaceutical grade is of interest as a thickener, solubilizer, detoxifier, and stabilizer, particularly in the cosmetic and food industries."

PVP in commercial quantities is produced in General Aniline's Grasselli, N. J., plant.

BUY POLYOLS ON FACTS



Sorbitol keeps products "fresher" longer...

As shown by the graphs, sorbitol picks up moisture at a slower rate at high humidities (upper chart) and dries out more slowly at low humidities (lower chart). Moreover, sorbitol has an exceptionally narrow humectant range, which means that it gains or loses less moisture when transferred from one humidity extreme to the other. All of which adds up to greater protection for the "factory-freshness" of products containing sorbitol... pharmaceuticals, cosmetics, foods, cork products, glue specialties or tobacco products, to name a few.

...at lower cost

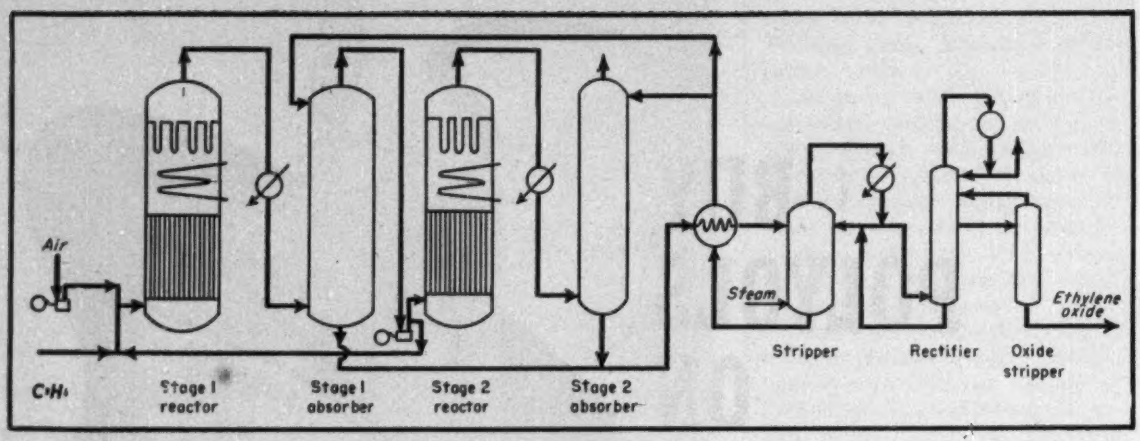
In the face of general inflation, the price of sorbitol has dropped continually since 1947 . . . while other polyols have fluctuated widely. This remarkable record has been accomplished through continued expansion and refinement of Atlas manufacturing facilities.

COMPARE ALL FOUR POLYOLS

before you buy . . . and choose the one that proves superior on *every count.* To aid in your selection, Atlas offers full technical information on sorbitol and expert engineering service to help you utilize sorbitol's unique characteristics in your product.

INDUSTRIAL CHEMICALS DEPARTMENT
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
offices in principal cities
ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

Write for your free copy of the new booklet "The Sorbitol Story."



New Way to Ethylene Oxide

Novel fluidized catalyst system for direct oxidation of ethylene uses a long vertical-tube reactor. Temperature and contact time are easy to control.

Fluidization, lusty adolescent offspring of the petroleum industry, is on the make in the chemical industry. Direct oxidation of ethylene to ethylene oxide may be the next process to yield to its advances.

Vulcan Engineering Div. of Vulcan Copper & Supply Co. picked up the basic research work of Atlantic Refining Co. on this process and has developed engineering and design data in an integrated pilot plant in Cincinnati. The process is now ready for commercialization.

Several potential customers are right now studying preliminary plans and estimates for full-scale plants; signing of the first contract may be announced soon.

▶**Uses Long Tubes**—Conventional fluid-solids reactors take the form of large cylindrical vessels in which the solids are free to circulate from top to bottom of the bed. Vulcan's reactor, however, is purposely designed to eliminate this back-mixing of catalyst.

This is achieved by restricting the diameter of the catalyst chamber—and providing a multiplicity of parallel chambers in the form of long vertical tubes. Vulcan's pilot plant includes a multi-tube reactor and several single-tube reactors of various sizes. Just exactly what diameter and length of tubes will be used commercially, and the gas velocities through them, is part of Vulcan's hard-won engineering know-how.

▶**New vs. Old**—The new process will have to compete with two older ones—the chlorhydrin route, and the direct oxidation route using a fixed catalyst bed.* It offers obvious advantages over both, but the comparative economics are rather involved.

The chlorhydrin process requires substantial quantities of chlorine and lime, and capital investment is appreciably higher. Corrosion is a real problem. Some ethylene dichloride is unavoidably formed; profitable disposition may be another problem. On the credit side, the chlorhydrin process is well established commercially—an important consideration with management and investors—and over-all yield on ethylene is good, running about 70 percent.

Direct oxidation by either fixed or fluidized bed needs no raw materials other than ethylene and air, makes no ethylene dichloride, and requires less capital investment. On the other hand oxide yield from ethylene is less, usually about 55 to 65 percent.

Vulcan's engineering manager, Ray Katzen, is quick to point out that direct oxidation plants, too, can be designed and operated at yields approaching 70 percent, but with ethylene at, say 4½¢ per lb. the optimum economic yield is close to 60 percent.

▶**Improved Control**—Direct oxidation's Achilles heel has been, until now, difficulty in control. The reaction is highly exothermic; temperature control is a major problem. And extreme care is required to minimize the extent to which complete combustion (to CO_2 and water) is allowed to occur.

Fixed-bed units take care of the heat-removal problem by placing the catalyst in small-diameter vertical tubes surrounded by circulating oil or some other suitable cooling liquid. But a commercial reactor may contain several thousand tubes. This makes it rather expensive, and even distribution of feed to all tubes is a pretty tough job.

The fluidized bed is a natural for good temperature control, as every chemical engineer knows. And a glance at the instrument panelboard of Vulcan's pilot unit would convince even a confirmed skeptic.

▶**Contact Time Is Critical**—But the conventional fluidized bed has one serious fault as far as ethylene oxidation is concerned: The usual back-mixing of catalyst unavoidably holds some of the gas phase in the reactor for a longer time than indicated by the over-all superficial gas velocity. In hydrocarbon cracking this isn't too serious, but in ethylene oxidation the time in contact with the catalyst is critical. Back-mixing would give the ethylene oxide time to undergo further oxidation, reducing the yield of oxide.

This, then, is why Vulcan developed the "confined" fluidized bed. The reactor costs more than the usual fluid-solids type but much less than

* See report on "Petrochemical Processes," *Chem. Eng.*, Sept. 1952, p. 161.

PLASTIC ARMOR

METAL TUBE

Specify "Dekoron-Coated" E.M.T.

THE PROTECTED STEEL RACEWAY

If highly corrosive fumes and atmospheres are making short work of conduits in your plant, investigate "Dekoron-coated" E.M.T. It stands up for years and years against

Salt-laden, moisture-saturated fumes in meat-packing plants . . .

Hydrogen sulfides and moisture in sewage disposal plants . . .

Acids and alkalies in chemical and processing plants . . .

A plastic armor is extruded over zinc-coated steel ELECTRUNITE E.M.T. to provide *double-protection* against your toughest atmosphere. The threadless-connections between lengths of E.M.T. are easily and completely protected by easy-to-apply electrical tape. It's real "end-to-end" protection of raceways against corrosion.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st STREET • CLEVELAND 8, OHIO

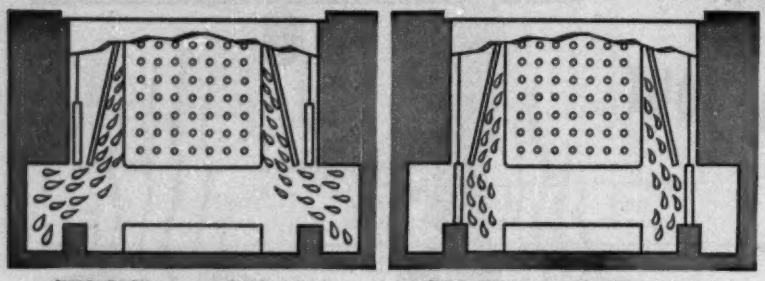
WRITE TODAY . . . *for technical information on "Dekoron-Coated" E.M.T. . . . it gives years of service where operating conditions are rough on raceways.*

Republic
REPUBLIC STEEL
ELECTRUNITE
"Dekoron-Coated" E. M. T.

LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

LOOK!

2 successive liquids separated without mixing



CURB OPEN to permit first liquid to be separated and evacuated from machine.

CURB SHUT, second liquid is separated and removed through lower outlet without mixing with first liquid.

Industry benefits from broad use of centrifuging . . .

thanks to new AT&M developments. The centrifugal above — a profitable investment wherever two or more liquids are separated in a cycle — is but one of many outstanding AT&M centrifugals that save time, space, costs.

As the drawings above show, this curb is designed to remove two *successive* liquids without mixing. With the curb open, the first liquid is separated and evacuated through the curb outlet. The curb is then closed and the second liquid is separated and removed through a different outlet.

You, too, can benefit with AT&M equipment. Does away, in many instances, with settling tanks, filter presses, squeeze rolls, vacuum presses. Used in processes involving chemical preparations — explosives — nitrating — acid wringing — ammonium sulphate — food products — soap — drugs, medicines, cosmetics — oils and greases — paints, varnishes — ceramics, brick, clay — fertilizers — nitrates — sludges — textiles — carbonizing (textiles) — plastic bases.

Find out now how AT&M centrifugals can help you. Send for free booklet today.

P.S. PROVE TO YOURSELF how centrifuging can benefit you. Send us a sample of your material for centrifuging to your specifications or rent an AT&M laboratory centrifugal for your own tests at a nominal fee.

FUME-PROOF. No gases can escape from this specially designed AT&M centrifugal. Its fume-tight hood — originally developed by AT&M engineers to solve a special problem — is now used to advantage by many firms processing volatile liquids.

FREE
ILLUSTRATED BOOKLET

AMERICAN TOOL & MACHINE COMPANY
1415 Hyde Park Avenue, Boston 36, Mass.

Please send me my free copy of the new AT&M booklet "Centrifugal Force." I am interested in the following processes:

Separation ☐ Extraction ☐ Dehydration ☐ Clarification ☐ Coating ☐
Filtration ☐ Draining ☐ Thickening ☐ Impregnation ☐ Sedimentation ☐

ANY OTHER PROCESS.....

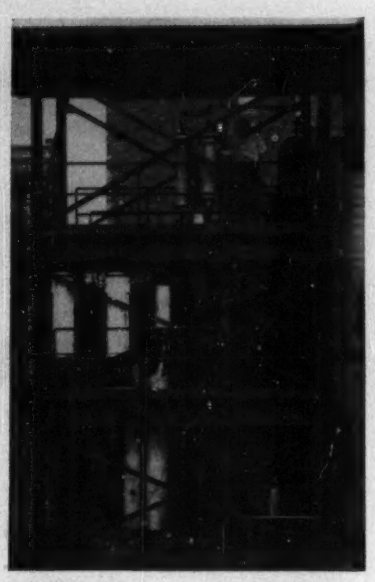
Name.....*Title*.....

Company.....

Street.....

City.....*Zone*....*State*.....

SAVE TIME, SPACE AND COSTS WITH A.T. *and* M. CENTRIFUGING



FEASIBILITY is proved in pilot unit.

the fixed-bed design because, fundamentally, less heat-transfer surface is required in the fluid-bed reactor for a given ethylene oxide output.

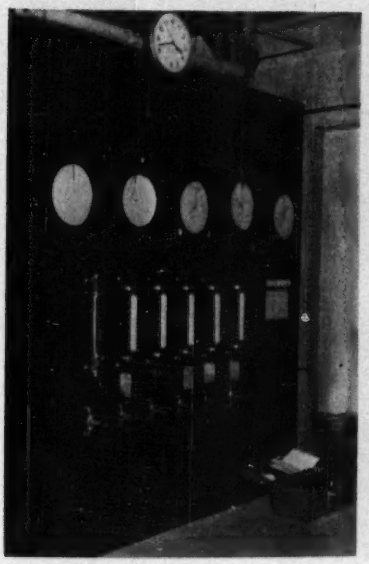
► **Gas Distribution**—Vulcan has a neat solution to the problem of distributing reactants uniformly to the tubes. Part of the trick is a specially designed orifice metering gas flow to each tube.

The orifice is assisted in its function by a sort of self-regulating action inherent in the fundamental mechanics of a fluidized-solids system. The reactor runs with the top tube-sheet flooded with catalyst. With pressure drop across the orifice providing fixed control of gas flow and the pressure drop through the fluid catalyst in each tube being a function of gas space velocity, the head of catalyst above the tubes acts as an automatic regulator of catalyst distribution.

► **Process Details**—Any commercial ethylene of 95 percent or better purity can be used. Lower purities may be tolerated in the fluid-bed operation because of the ease of temperature control.

Oxidation is carried out under pressure at elevated temperatures. There are usually two stages of oxidation, with cooling and absorption following each stage (see *flow sheet*). Conversion in Stage 1 is about 35-50 percent, in Stage 2 about 50-70 percent.

Unconverted ethylene and air from the first stage are recycled; the second stage operates as a once-through treatment of the vent gas.



CONTROLLABILITY is also important.

A special catalyst has been developed with unique fluidization characteristics in a completely captive bed. No regeneration or reactivation is required and no measurable attrition occurs over long operating periods, Vulcan claims.

Off-gas from each reactor is absorbed in water under reactor pressure. Pressure is then reduced, and the liquid stream goes to a stripper operating with direct steam.

Stripper overhead goes to a partial condenser; condensate returns to the stripper as reflux, vapor phase passes to a rectifying column. Final product cleanup (removal of CO_2) takes place in another stripper. Product is better than 99.5 percent ethylene oxide and recovery may be said to be essentially complete.

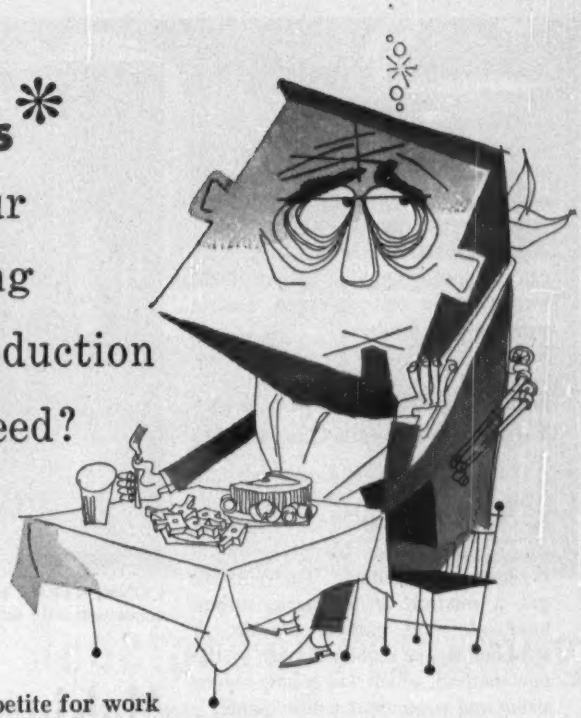
► **Equipment Details**—The catalytic section of each reactor is cooled with boiling Dowtherm. Dowtherm vapors can be condensed in a waste-heat boiler to generate process and mechanical-drive steam.

Superimposed on the catalytic section of each reactor is a series of cooling coils. Above that is a bank of porous alumina filters. These filters have worked nicely in the pilot plant; blowback is not needed.

The rest of the equipment is conventional—bubble-plate towers, tubular condensers and exchangers, etc. As far as instrumentation is concerned, the only noteworthy detail—although not unique—is the primary control of the rectifying column by regulating the amount of uncondensed

does

coil-itis* have your processing tank production off its feed?



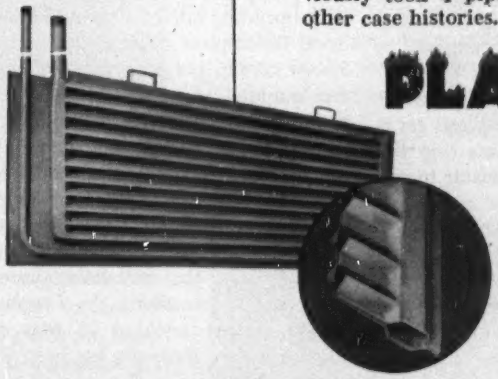
When the appetite for work of your heating and cooling processes diminishes, the trouble may well be coil-itis. For, downtime due to pipe failures and limitations can seriously delay your production flow. Switch to Platecoils, the new tonic for production, as revolutionary as the new wonder drugs. Platecoils take 50% less tank space leaving more room for greater payload. They heat or cool 50% faster. They simplify maintenance and save hours of downtime. Equally important, Platecoils cost as much as 50% less in the first place. Platecoils cure production troubles involving heat transfer and give production a shot in the arm.

Write for Bulletin P61 today!

PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS

PLATECOILS ELIMINATE A 6-TO-8 HOUR-A-DAY CHIPPING JOB

At Sealed Power Corp., installation of Platecoils has completely eliminated a 6-to-8 hour-a-day chipping job. Three Platecoils now heat a tank that previously took 4 pipe coils. Ask about other case histories.



PLATECOIL

REPLACES PIPE COILS

*Coil-itis — Diagnosed as tank heating and cooling problems. Platecoils — the prescription for solving pipe coil problems.

PLATECOIL DIVISION, KOLD-HOLD MANUFACTURING CO., LANSING 4, MICHIGAN

vapor leaving the stripper partial condenser.

Although ethylene oxide is essentially noncorrosive, the combination of pressure, temperature, oxygen and carbon dioxide in many parts of the system is a little beyond the limits of good practice for carbon steel. Vulcan is specifying stainless steel for some of the equipment in contact with process fluids.

Bureau Finds Cheaper Way To Rid Synthesis Gas of CO_2

A new and cheaper process for purifying synthesis gas made from coal has been developed in the Bruceton, Pa., synthetic fuels laboratory of the U. S. Bureau of Mines. The synthesis gas, a mixture of hydrogen, carbon monoxide and carbon dioxide, is scrubbed free of carbon dioxide by the new method, which will greatly reduce steam and equipment requirements.

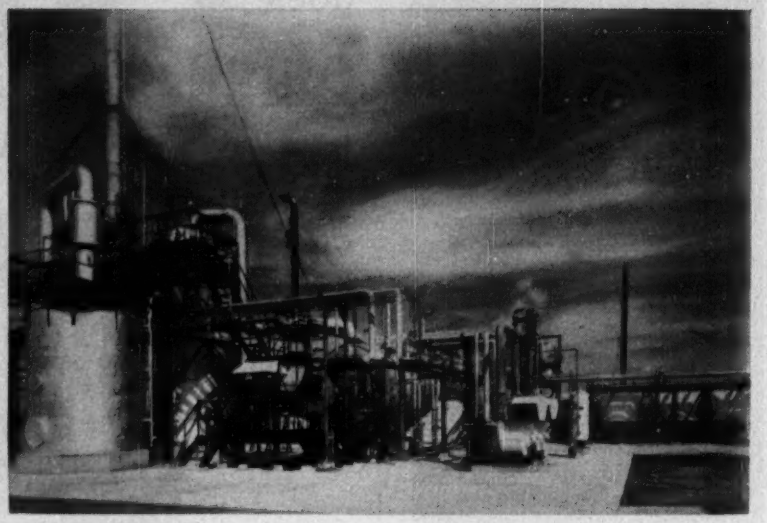
In the new process, according to Homer E. Benson, J. H. Field and R. M. Jimeson, three of the Bureau's chemical engineers who helped to develop it, the synthesis gas is treated under elevated pressure with a hot concentrated solution of potassium carbonate. The solution absorbs the carbon dioxide.

After the solution has been separated from the synthesis gas, a unique engineering trick eliminates the carbon dioxide from the solution. The solution is passed to a regeneration column and the pressure is reduced. This causes the solution to boil, giving up its carbon dioxide. It is then ready to be used again to clean more synthesis gas.

Because absorption and regeneration occur at the same temperature, no heating and cooling of the solution are necessary. This conserves large quantities of steam and cooling water and eliminates heat exchangers required in processes now in operation.

Once purified of carbon dioxide and sulphur impurities, the synthesis gas is passed over catalysts, converting the hydrogen and carbon monoxide to gasoline, oil and gases for use as fuels.

The carbon dioxide removal method should be effective not only in reducing the cost of liquid and gaseous fuels from coal, but also in other processes for the manufacture of ammonia and other chemicals from coal and natural gas.



CONVERTERS, H_2S burner and waste heat boiler, air blower and three air-cooled steam condensers with fin tubes.

Making Sulphur Recovery Pay

First modified Claus process installation designed from scratch by the Ralph M. Parsons Co., the sulphur recovery unit of Consolidated Chemical Industries Inc. at Baton Rouge, La., has in its first year of successful operation thoroughly demonstrated what it can do. The plant was designed to turn out 30 tons of sulphur a day.

In actual operation, production has ranged from as little as 5.5 long tons of sulphur per day to as much as 35 long tons. At times a limited supply of gas containing hydrogen sulphide and coming from the nearby refinery of Esso Standard has kept the recovery plant from operating at capacity.

Over-all recovery of sulphur at the low operating rate was 50 percent and at the high rate above 95 percent. The breakeven point for this plant has been at an operating rate of 20 tons per day based on sulphur delivered at Baton Rouge at $26 per long ton. Whenever output is above 20 tons per day the unit operates at a profit.

Designed to handle gas containing 50 percent H_2S, the unit can operate at a minimum concentration of 15 to 20 percent. Currently, the gas used analyzes about 50 percent H_2S and 45 percent CO_2, the rest being water vapor and hydrocarbons. In a recent month, output averaged 28 tons of sulphur a day. Recovery has been 97 to 98 percent.

In this modified Claus process, hydrogen sulphide is burned to sulphur dioxide. Then the sulphur dioxide is reacted with additional hydrogen sulphide to get sulphur, together with water vapor.

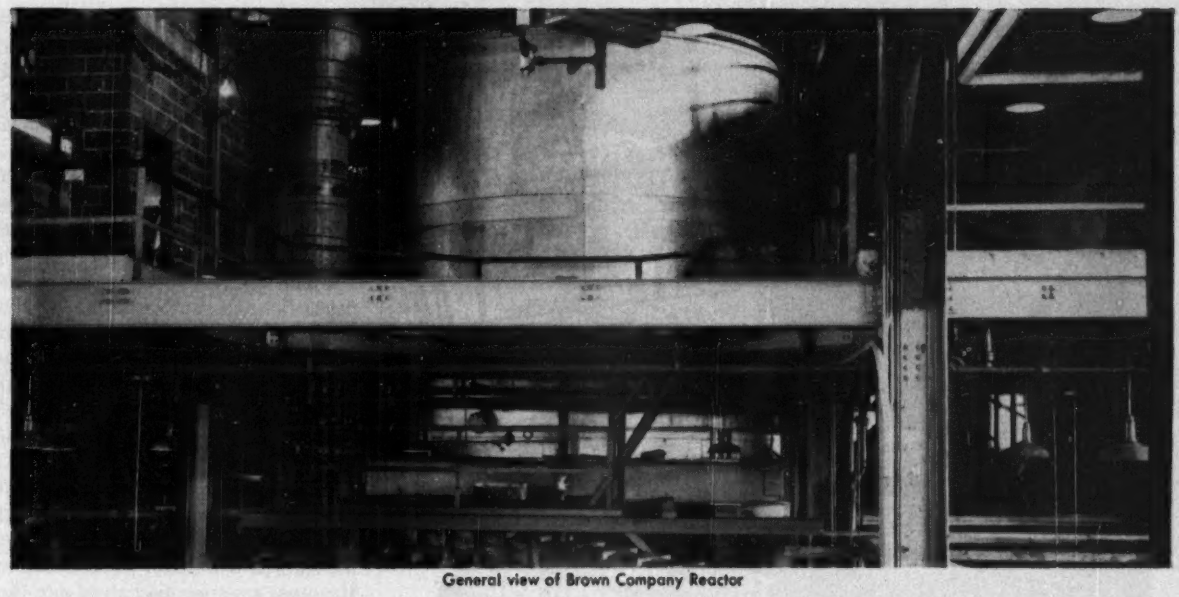
The acid gas is partially burned with a controlled amount of air in a combustion chamber, whence the combustion gases pass into a waste heat boiler, where steam is produced. Combustion chamber and waste heat boiler operate at less than 10 psi.

Combustion and exothermic heat of reaction make possible a substantial production of 150-lb. steam, used for the turbine-driven air blower, sulphur pump and other services. Thus the plant is self-sufficient to the extent that it requires no outside fuel other than for starting up.

Reactions producing the sulphur start in the combustion chamber, and much of the sulphur produced is condensed in the waste heat boiler and removed from it.

Gases from the boiler pass through the first catalytic converter, which is of brick-lined steel. There the reaction proceeds further, and then the gases go into a vertical shell and tube condenser, where sulphur is liquefied and separated from the gas stream. This sulphur condenser produces low-pressure steam.

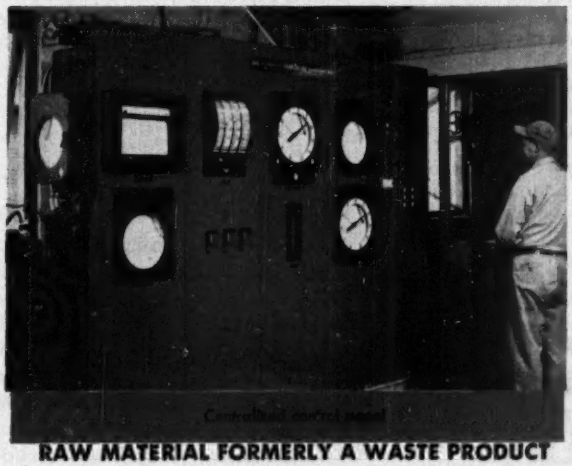
Coming from the sulphur con-



General view of Brown Company Reactor

First Dorrco FluoSolids* Reactor For Producing SO_2 Goes "On Stream" at Brown Company

BERLIN, N. H. In anticipation of a continuing sulfur shortage, The Brown Company at Berlin, N. H. recently installed a Dorrco FluoSolids System to produce SO_2 gas from pyrrhotite. The System at the present time is supplying the entire sulfur requirements of this sulfite pulp mill . . . 11,000 tons of sulfur equivalent per year. A producer of quality pulp for high-grade photographic papers, Brown requires clean, high-strength SO_2 gas to make their sodium sulfite cooking liquor.



Control board control panel

RAW MATERIAL FORMERLY A WASTE PRODUCT

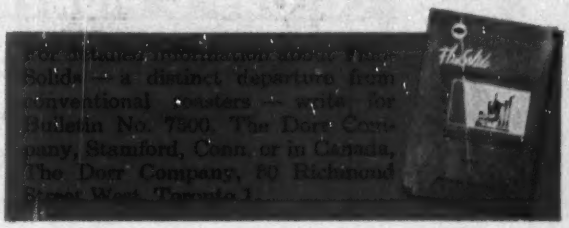
The pyrrhotite, recovered from tailings of a nearby copper mine, is received in a moist condition, repulped with water to 70-75% solids, and pumped into the Reactor. By operating close to theoretical oxygen requirements, the strongest possible SO_2 gas is produced, with a black magnetite calcine which is quenched and handled in slurry form. Roast is accomplished in a 16' inside diameter Reactor with the temperature automatically held at 1650°F.

Clamshell discharging pyrrhotite into storage

HIGH STRENGTH SO_2 PRODUCED

Gas strength at the top of the Reactor averages 13% SO_2. The gas then passes through a two-stage cyclone system followed by a cooling-scrubbing tower before going to the acid towers. Average chemical analysis of feed and calcine follows:

	Total Sulfur	Sulfide Sulfur	Total Fe
Pyrrhotite Feed	35.7	35.6	49.1
Combined Calcine	0.51	0.49	60.9



for further information about Dorr-Fluo Solids — a distinct departure from conventional roasters — write for Bulletin No. 7500. The Dorr Company, Stamford, Conn. or in Canada, The Dorr Company, 80 Richmond Street West, Toronto 1.

* Trademark Reg. U. S. Pat. Off.

If your job involves color formulation and the selection of pigments, you'll welcome the useful information contained in these handy technical reports. They've been prepared by Williams to make it easier for you to quickly select a pigment having chemical and physical properties which hit your color specifications "on the head". Each report describes the origin of the pigment, how it is made, its chemical and physical properties, and its applications. The reports cover Pure Red Iron Oxides, Pure Yellow Iron Oxides, Chromium Oxides, Venetian Reds, Siennas and Umbers, Metallic Browns and others. Write today for your complete set. Address Department 3, C. K. Williams & Co., Easton, Pennsylvania.

WILLIAMS
COLORS & PIGMENTS

C. K. WILLIAMS & CO.

East St. Louis, Ill. • Easton, Pa. • Emeryville, Cal.

108 Shades and Types of Iron Oxide Pigments

denser, the process stream is reheated by mixing it with combustion gases from an auxiliary burner in which some additional acid gas is burned with air. The reheated stream then goes to a second converter, where the reaction continues and more sulphur is produced.

From the second converter, the gas passes through another shell and tube condenser, where the added sulphur is separated. Waste gases from this second condenser pass through a packed coalescing tower containing a bed of Raschig rings. This removes small amounts of entrained sulphur in the gas stream. Then the waste gases go to an incinerator in which remaining hydrogen sulphide and sulphur vapor are burned to sulphur dioxide before the waste gases are discharged into the stack.

Sulphur is withdrawn from various points as it is condensed, coming from the waste heat boiler, the converters, the sulphur condensers and the coalescer. All sulphur goes to a single concrete underground storage tank, from which it is pumped to trucks or tank cars for shipment.

Low-pressure steam produced in the sulphur condensers and exhaust steam from the turbines is condensed in an air-cooled unit, the condensate being returned to a deaerator and then used as boiler feed for the waste heat boiler and sulphur condensers.

This plant is producing sulphur for the manufacture of sulphuric acid, and is helping to increase the U. S. supply of critical sulphur by utilizing gases that otherwise would be burned for no useful purpose.

Packaged Plant Suggested to New Producers of Solid CO_2

Making dry ice from waste carbon dioxide gas may be a profitable venture for certain companies, according to H. A. Sommers, assistant chief engineer of the Westvaco Chemical Division of Food Machinery & Chemical Corp., especially now that the courts have paved the way for new producers.

"A consent judgment recently signed in federal court breaking up an alleged monopoly held by five major companies," Sommers told AIChE members in Cleveland, "opened the way for companies having waste carbon dioxide gas to use it in making liquid and solid carbon dioxide which

might be a profitable product." Since first introduced principally as a refrigerant, carbon dioxide has found steadily growing markets until today it can be considered a heavy chemical.

A new self-contained plant, described by Sommers, adapts itself to the idea of locating a plant near a consumer's market. These plants operate as highly integrated units, the fuel being burned under boilers to produce raw carbon dioxide and steam, the high-pressure steam driving the carbon dioxide compressors, pumps and other equipment, and the back-pressure steam utilized to strip the amine absorbing solution.

Sources of carbon dioxide can, according to Sommers, be evaluated by four factors. First in importance is the inherent nature of the source, which guarantees that enough carbon dioxide of the required quality will be available when needed. Next is the dilemma of manufacturing on a large economical scale away from points of consumption or on a smaller, more costly scale near the consuming market. Third, the purity of the carbon dioxide source must be considered because where absorption facilities are required nearly half the cost goes to produce the 100 percent gas. The fourth factor is that some sources have value because of their pressure.

Polyvinyl Chloride: Added capacity for producing polyvinyl chloride film is being built at its Indian Orchard, Mass., plant by Monsanto Chemical Co. The $2.7 million plant will supplement production from the present plant at Indian Orchard.

Cobalt: DPA has raised the expansion goal for cobalt by an added 6 million pounds to a new goal of 27 million pounds of cobalt a year from foreign and U. S. sources by 1955. The new goal is 17 million pounds more than the U. S. supply of 10 million pounds in 1950. New refineries in Idaho and Missouri will get cobalt from U. S. ores.

Jet Designs: As a chemical engineering offshoot of the new jet era, the Jet-Vac Corp. has been organized in Boston as an affiliate of Artisan Metal Products, Inc. Jet-Vac will design and build ejectors and related equipment. It will aim at industries with corrosion problems and those in which control of low pressures is essential. —*End*

SHARP & DOHME Reports:

ERIEZ PERMANENT MAGNETIC SEPARATORS ASSURE CONSTANT INSULIN PRODUCTION

Extraction of insulin at the Philadelphia plant of Sharp & Dohme, Inc., starts with the grinding of beef pancreas glands. To prevent nails, bolts, wire and other tramp iron (see insert illustration) sometimes accumulated in packing and shipping of glands from getting into the pancreas grinder, two ERIEZ plate-type magnetic separators are suspended over the conveyor line. The Alnico V magnets remove tramp iron each day from the pancreas glands . . . prevent damage to the cone, worm and cutter of the grinder, and eliminate possible lay-off of men during machine downtime. Vital production of insulin at Sharp & Dohme is *never* stopped because of tramp iron inclusions!

Plate-type Separators, hinged for easy cleaning of ferrous contamination, remove tramp iron daily from beef pancreas processing line.

Eriez permanent (non-electric) plate-type magnetic separators, built in a full range of sizes for chemical processing lines, assure you that strength for strength . . . size for size . . . dollar for dollar . . . no ordinary permanent magnet compares!

Here are 5 features found only in Eriez permanent magnetic separators:

1. Protective cover prevents tampering and accumulation of iron on backs of castings with consequent shorting of magnetic circuit.
2. All units complete, for wood or steel installation . . . no adaptations required.
3. Continuous hinge means easy and lasting installation.
4. Powerful Hyflux Alnico V gives greatest possible magnetic strength.
5. Riveted construction adds rigidity . . . increases structural strength.

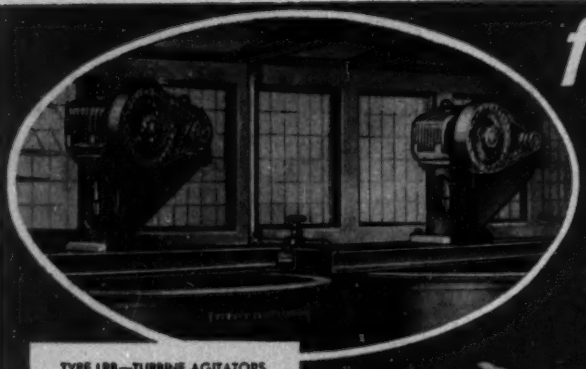
Write for FREE 16-page Catalog 15 which describes 25 different Magnetic Separators for the chemical industry.

ERIEZ MANUFACTURING COMPANY

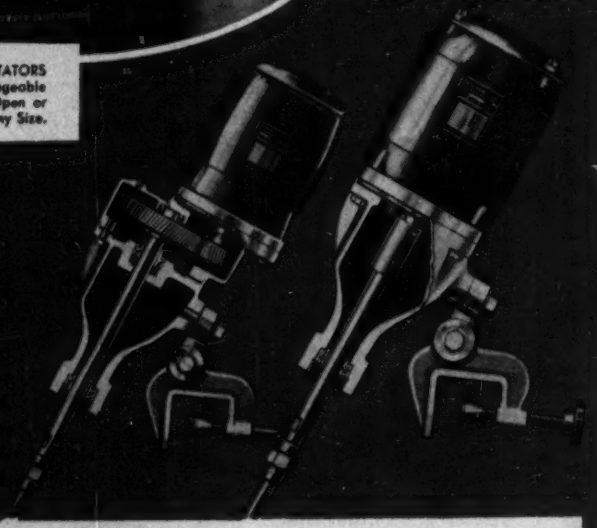
14 Magnet Drive • Erie, Pennsylvania

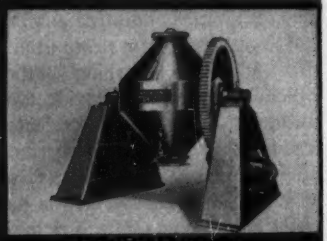
"Buy Permanent Protection . . . by ERIEZ"

for Greater Savings in Production Costs

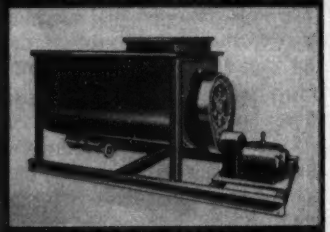


TYPE LRB—TURBINE AGITATORS with V-Belt Drive. Changeable Speed. Available for Open or Closed Pressure Tanks. Any Size.



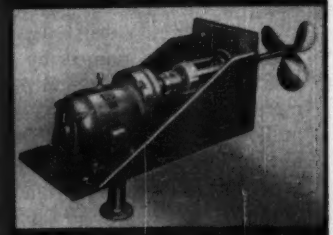


DRY BLENDERS
From 25 to 10,000 lbs.



RIBBON MIXERS
From ¼ to 175 cu. ft.

BALL MILLS
Welded Steel Construction



SIDE ENTERING MIXERS
½ to 30 H.P.

"International"
Complete Processing Systems

To the Chemical and allied Industries, INTERNATIONAL ENGINEERING offers the most complete line of Modern PROCESSING EQUIPMENT ever presented—with a completely INTEGRATED and perfectly BALANCED SYSTEM of operation, for the highest efficiency and lowest costs.

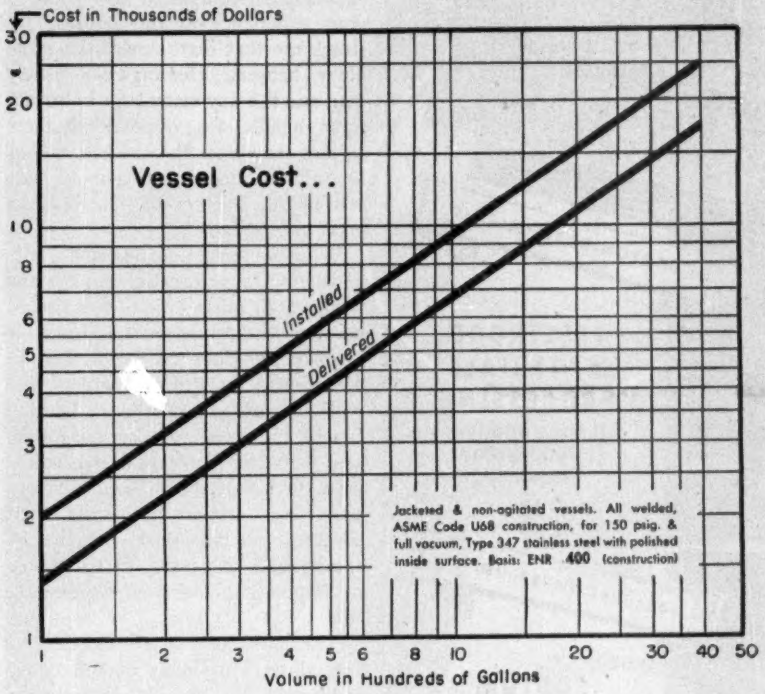
When you're making improvements, building a new plant, or expanding your present facilities, be sure to check with INTERNATIONAL for the latest Engineering Developments in improved EQUIPMENT for the correct and most economical BLENDING, TREATING, MIXING and GRINDING of Chemical components.

REMEMBER—INTERNATIONAL manufactures and Guarantees the Equipment you need, in any required sizes and capacities . . . Write today for Special Catalogs on any product. No obligation.

INTERNATIONAL ENGINEERING, INC.
DAYTON 1, OHIO

NEW YORK—15 Park Row WOrth 2-2580
CHICAGO—407 S. Dearborn WAbash 2-0733
DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

Pro and Con



More on Estimation of Vessel Costs

Sir:

Predesign cost estimates have become a very definite part of our process engineering work in this office. They have been particularly valuable in budgeting and process evaluation.

For the past two years I have used a method, with slight modification, that has been based upon your article "Cost Data Correlated" by Chilton (June 1949, p. 97). It is modified only to make it more applicable to our particular work. The method is accurate, fast and reliable within the recognized assumptions.

The data above are for jacketed and non-agitated all-welded vessels, ASME code U-68 construction, for 150 psig. or full vacuum. The material of construction is 347 stainless steel with polished inside surface.

C. E. Cottrell
Chief, Design Branch
Chemical Corps Biological Laboratories
PP Division
Camp Detrick, Frederick, Md.

▶ *We appreciate the opportunity Reader Cottrell gives us to pass along this additional information; we hope you can use it in your own predesign cost estimates. The article he refers to was written by Cecil H. Chilton—then an engineer with Du Pont, now an associate editor with CE.*

We encourage other readers to send in their own contributions to our series on data and methods for cost estimation.—Ed.

Adsorption: Pro

Sir:

Congratulations on the series of articles on adsorption in your October issue. I was particularly impressed by Treybal's method of comparing adsorption techniques with other separation processes. . .

The entire series of eight articles was a readable, enlightening "refresher" for me. I couldn't help but wish that I had been introduced to the subject in a similar manner when I was in college some 13 years ago.

I'm hoping you plan other "refresher" symposia along the same lines.

Charles J. Farrar
Development Engineer
Baltimore, Md.

Sir:

Your series of articles in the October issue of *Chemical Engineering* was read with much interest. We were especially interested in the article by Frank Browning of Carbide on equipment.

Mr. Browning is well remembered here at Celco since he engineered the installation of our first recovery unit. But we were not aware of his prowess as a writer.

We look forward to a more detailed article on Hypersorbers.

William C. Burgess
Asst. General Foreman
Acetone Recovery Dept.
Celanese Corp. of America
Narrows, Va.

Sir:

Do you have available reprints of your 20-p. report on "Adsorption" which you published in October? If so, will you please tell me what the cost would be for two copies?

I also have another question: Have you published similar reports on the other unit operations? If you have, I would like to get copies of them, too. I subscribed to *Chemical Engineering* last May (your Process Instrumentation report sold me) and I like your reports since then so much that I'd like to get copies of all of them.

Milton J. Reilly
Engineer
Chemical Process Equipment
Long Beach, Calif.

▶ *Yes, we have coming up several feature reports that Reader Farrar might possibly classify as "refreshers": Evaporation for April, Fluidized Solids Techniques for May and a special issue on Heat Technology for June.*

All our feature reports for the past year—as well as current ones—are available in reprint form. See our Reader Service section (inside back cover) for titles, prices and convenient ordering card.—Ed.

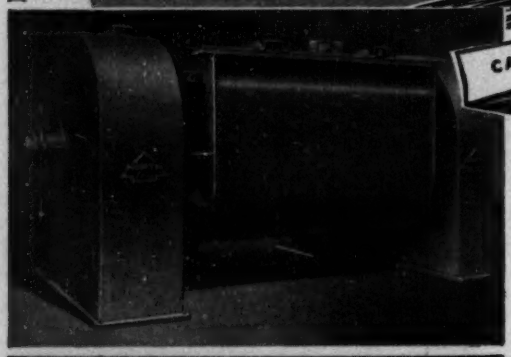
What About Old Equipment?

Sir:

Hemingway's story of "The Old Man and the Sea"—the story of a great effort that results in heart-rending frustration—impressed me greatly. As a fisherman I can understand the old man's utter dejection when he

• NORTH ERIE • NORTH ERIE • NORTH ERIE •

ALUMINUM *also* is our business



CARBON PASTE MIXERS

ELECTRODE MATERIALS PROCESSING

All sizes and types to 2000 gallons capacity

PRESSURE FILTER UNITS

SODIUM ALUMINATE CLARIFICATION

300 sq. ft. to 3000 sq. ft. filter area

AUTOMATIC FABRICATORS

AUTOMATIC FABRICATION and WORK HANDLING EQUIPMENT

complete engineering data available on request

NORTH Erie

THE H. W. NORTH COMPANY

1735 PARADE STREET • ERIE, PENNSYLVANIA

ENGINEERING CONTRACTORS DESIGNERS AND SUPPLIERS

SPECIAL PURPOSE MACHINERY AND EQUIPMENT FOR THE BASIC INDUSTRIES

learns he has nothing but a skeleton, a carcass stripped of its value, as reward for all his effort.

And as an equipment man with 35 years experience in the business, it struck me that there is a striking anology between Hemingway's fisherman and the way many large industrial firms handle the disposal of their surplus equipment—carcasses taking up valuable space, rusting away, useless to others eager to put them to good use. Why?

Some companies set up salvage departments to transfer idle equipment within their organization. But the receiving department often turns it down rather than pay its book value or a charge that's usually out of line with its depreciated value. Besides, freight and handling costs are expensive items for bulky or heavy equipment that must be shipped to a distant plant. But in most cases, there simply is no individual with the authority and responsibility to dispose of surplus equipment in a profitable way. . . .

The problem is tough and calls for specialized knowledge of the equipment field. But the solution is simple: Call in a reputable used equipment dealer and use him as a consultant to determine whether you should (1) sell directly to the next user, (2) sell indirectly through the help of the dealer, or (3) sell directly to the dealer himself.

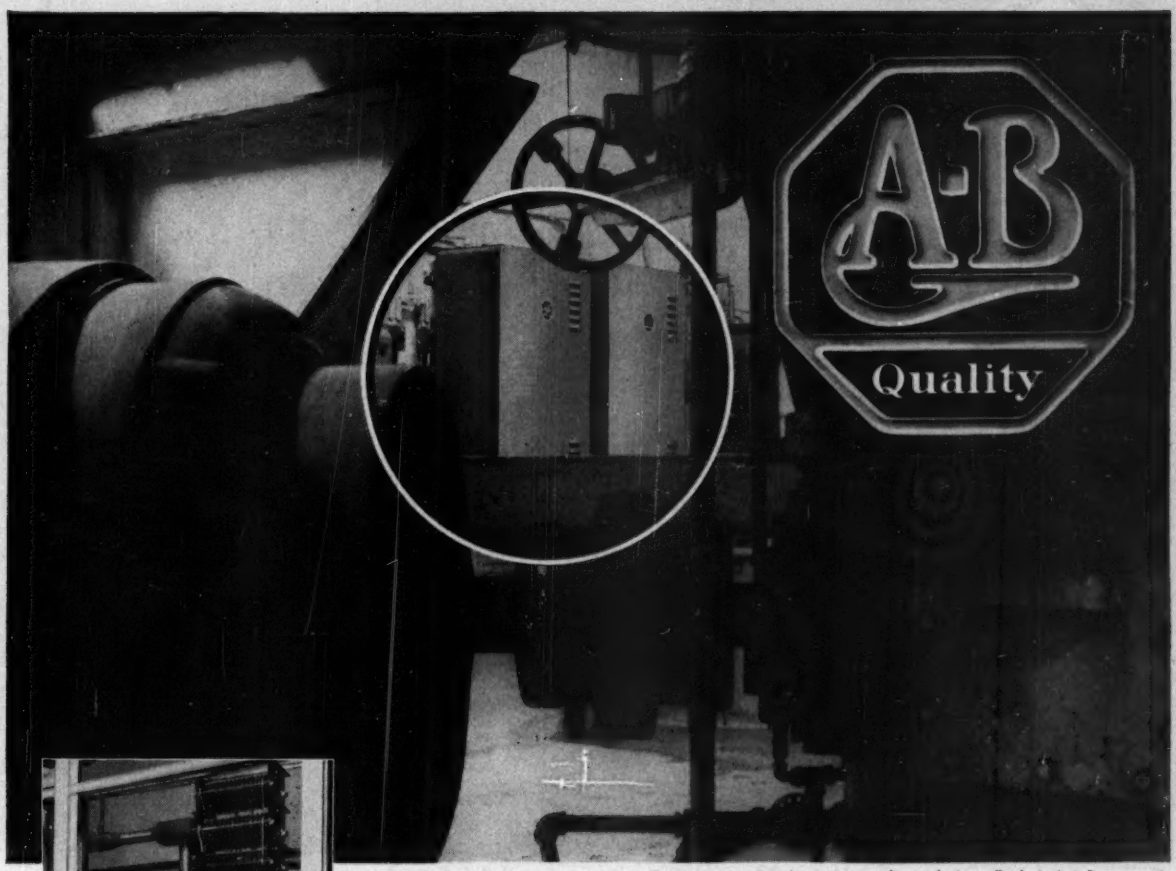
This is the type of specialized consulting service that the half-century old used machinery industry is well equipped to do . . . and has been rendering to the nation's equipment-using industries since the turn of the century.

Those equipment "dead fish" and carcasses cluttering up your plant are needed by industry and should be put to use. Only then can you convert useless assets into cold cash. . . .

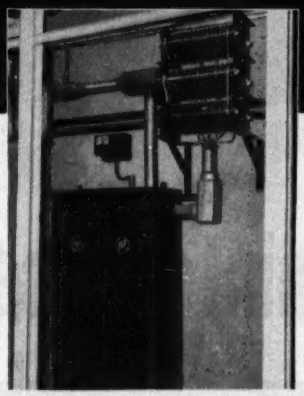
Fred R. Firstenberg
President
First Machinery Corp.
New York 13, N. Y.

▶ *Practical advice here on how to cash in on your surplus used equipment. And it's timely, too, for inventory time is here.*—Ed.

We welcome pertinent, informative letters from our readers. Address the Editor, Chemical Engineering, 330 West 42nd St., New York 36, N. Y.



Large hydrapulper controlled by A-B automatic slip ring starter, shown below. Encircled A-B magnetic resistance starters control the feeder stock pumps on this installation.



Close-up view of Allen-Bradley Bulletin 761 Automatic Slip Ring Starter, controlling the 200 hp motor driving the large hydrapulper above.

Large Hydrapulper

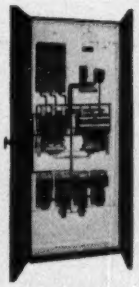
equipped with

ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

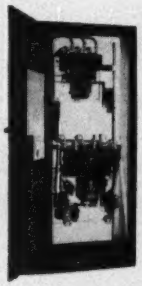
In this large eastern paper mill, Allen-Bradley motor controls are popular for use on such units as Jordan's, vacuum pumps, boiler feed pumps, fans, hydrapulpers, and feeder stock pumps. Reliable operation is the reason for such popularity.

The decision to use Allen-Bradley starters for your plant or on your equipment is a sound one. Their simple design guarantees millions of trouble free operations. Likewise, the double break, silver alloy contacts require no maintenance. Dependable overload relays are easily reset. Safe enclosures for every kind of control job are available. Consult with Allen-Bradley, today.

Allen-Bradley Co., 1337 S. First St., Milwaukee 4, Wis.



Allen-Bradley Bulletin 761 Automatic Slip Ring Starter. Note the neat wiring . . . roomy control panel.

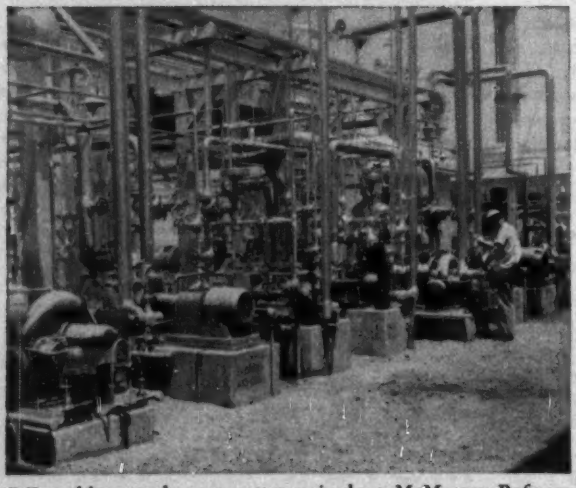


Allen-Bradley Bulletin 740 Magnetic Resistance Type Starter. Graphite disc resistors provide velvet smooth motor acceleration.

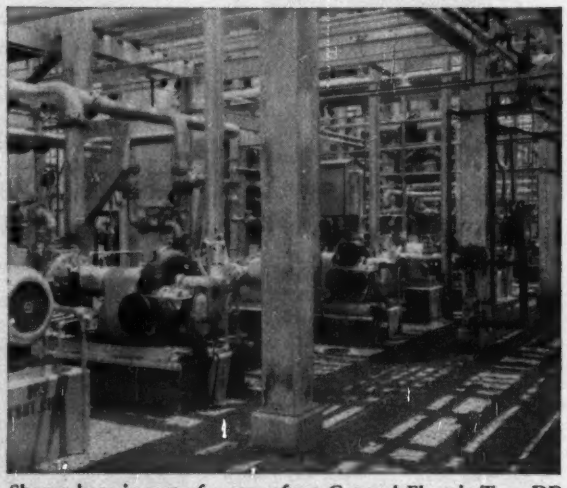
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

McMurrey Refining Company, Tyler, Texas, installed G-E mechanical-drive turbines throughout their plant to help assure continuous capacity output of 5000 bbls. per day.

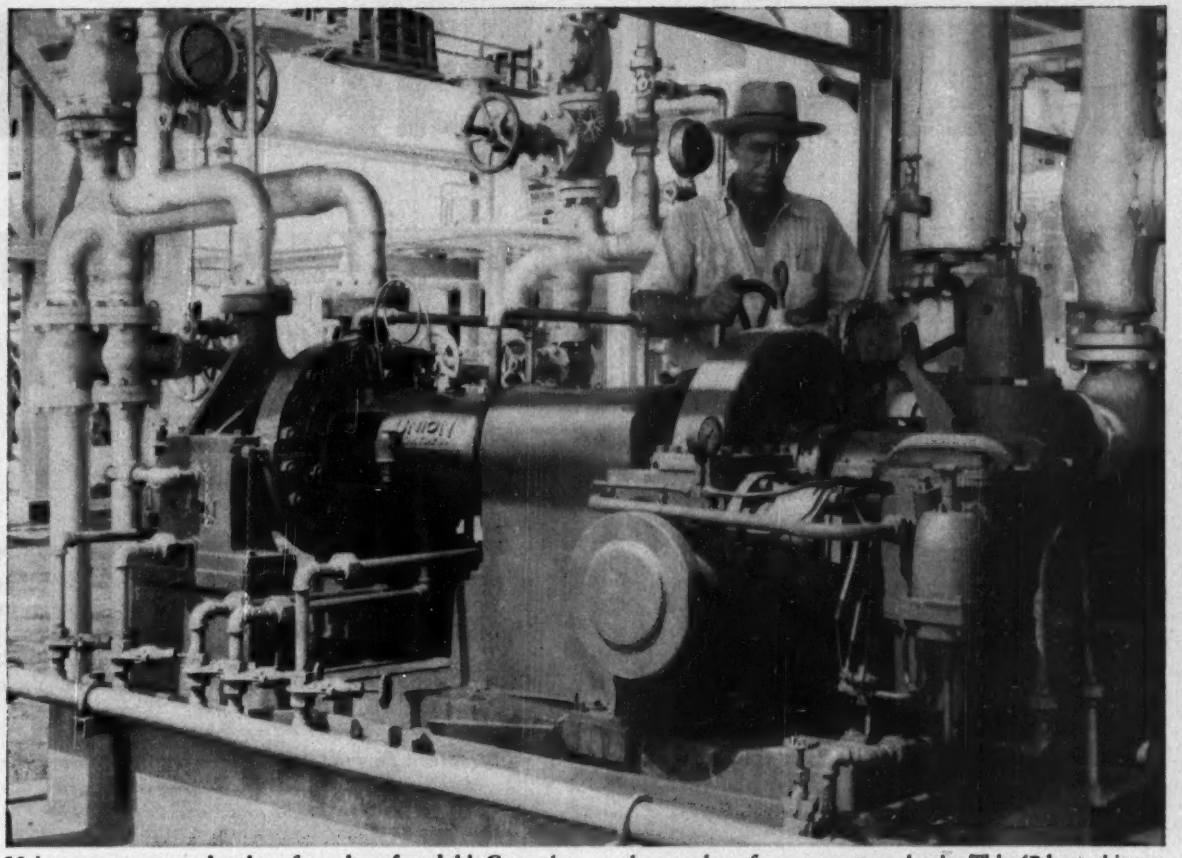
G-E Turbines Save Maintenance,



G-E turbines and motors are paired at McMurrey Refinery to utilize large steam supply efficiently. When process steam demands decrease, surplus steam is economically diverted to turbine drives. These Type DP turbines range from 8 hp to 41 hp.



Shown here is part of a row of ten General Electric Type DP turbine drives and motors, ranging from 9 hp to 48 hp. The many interchangeable parts on these turbines make stocking of spare parts an economical matter.



Maintenance personnel at the refinery have found this General Electric Type DP mechanical-drive turbine, like the many others at the refinery, easy to maintain. This 47-hp turbine at McMurrey Refinery drives a boiler-feed water pump.

Inventory Costs at McMurrey Refinery

Installed to improve steam balance, G-E standard turbines, with many interchangeable parts, also cut inventory costs.

The McMurrey Refinery, Tyler, Texas, installed General Electric mechanical-drive turbines to help regulate steam balance. Since process steam demands range from 30% to 70% of available supply, surplus steam is economically diverted to turbine drives.

Time soon proved that General Electric turbine drives have many other advantages. Mr. Dave Hood, Mechanical Maintenance Foreman at the refinery, states, "With these turbines on the line now for over a year, we're happy to report that they are extremely easy and economical to maintain, requiring very little of our time for maintenance."

Mr. Hood also said, "Since we have quite a few different sizes and ratings of turbines here, we're particularly pleased with the great number of interchangeable parts on these turbines. It certainly cuts down our inventory problem." Interchangeability of a great majority of the replaceable parts (regardless of hp rating) is a big feature with G-E standard turbine drives, which are paired with motors throughout the refinery to help assure uninterrupted service.

Call in your G-E sales-engineer or write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." Section 252-59, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

THIS IS THE TAYLOR

LATEST ADDITION: *The new TRANSAIRE®*

Differential Pressure Transmitter

WITH the addition of the new Taylor Transmitter, designed to measure flow, liquid level, or specific gravity, the TRANSET Control System can now measure and control practically any process variable with a precision never before possible.

For measuring, receiving, controlling — there is a wide range of instruments available within each of these three phases of the TRANSET system, making it adaptable to fit almost any control requirement. Each unit incorporates many new and exclusive Taylor features and techniques, and the units in each step are designed to take fullest advantage of the precision qualities of units in other steps. The TRANSET Pneumatic Transmission System gives you an unbeatable combination of instruments for:

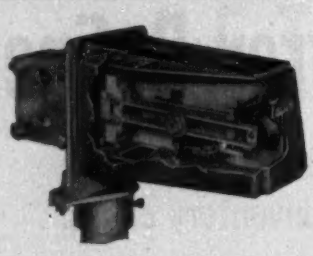
★ **More accurate measurement.**
★ **Closer control on any process.**
★ **Continuous, space-saving records.**
★ **Higher processing efficiency.**
★ **Unprecedented convenience in installation and servicing.**

Why not call in your qualified Taylor Field Engineer for information on TRANSET Control. If you can use it profitably, he'll tell you how; if not, he'll be equally frank! Alternatively, write for **Bulletins 98097, 98226.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

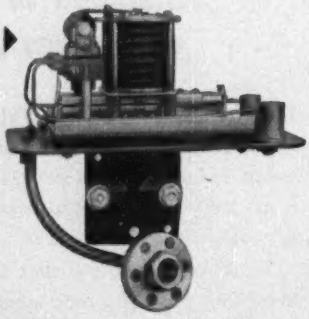
• • •

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

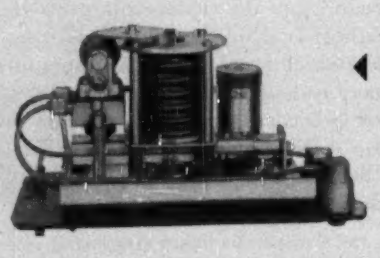
MEASURE



TRANSAIRE Differential Pressure Transmitter is a streamlined, light-weight transmitter, designed to meet present-day requirements for a rugged, dependable and accurate instrument to measure flow, liquid level, or specific gravity. Compact design, force-balance action, dry (mercuryless) type. Ten-to-one adjustability in each of two ranges: 20-200″ water; 80-800″ water.



TRANSAIRE Pressure Transmitter. A highly sensitive and accurate suppressed range pressure measuring instrument. Measures and transmits pressure changes up to 1000 ft. Accurate to ½% of the selected short range span and sensitive to pressure changes of ½″ water. Short range spans available: 20 or 40 psi. throughout range limits of 35 to 415 psia: and 50 or 100 psi. throughout 100 to 1000 psia.

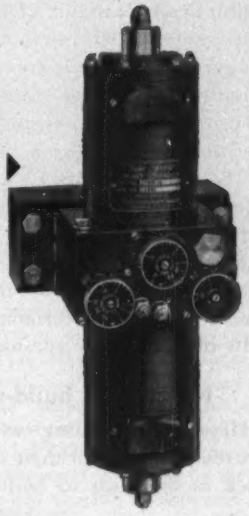


TRANSAIRE Temperature Transmitter. This compact, super-responsive instrument with a cigarette size bulb, is designed to measure and transmit smallest temperature changes up to 1000 ft. with great accuracy. Unprecedented speed of response provides dynamic accuracy thanks to derivative action (Speed-Act) in the *measuring* circuit. It will transmit an output pressure proportional to the measured temperature with an accuracy of plus or minus 0.06 psi. Many short range spans within limits of minus 375°F to plus 1000°F.

TRANSET® FAMILY!

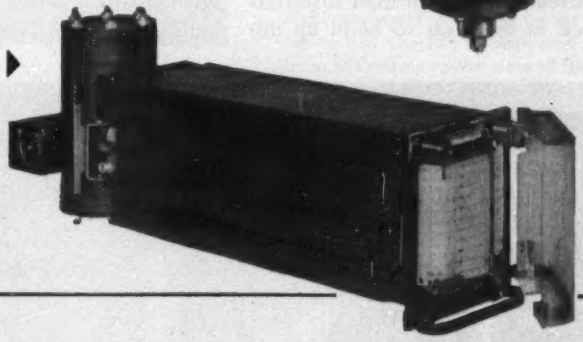
CONTROL

The TRI-ACT* Controller is a force-balance pneumatic controller with a new circuit embodying three control responses: proportional, PRE-ACT* (rate action), and automatic reset responses. Gives a precision of control never before believed possible, with faster, more stable recovery on load changes, no overpeaking on start-up. Can be locally or panel mounted.



BI-ACT* is TRI-ACT'S little brother. The BI-ACT Controller is a lower cost instrument with *two* control responses, proportional and automatic reset, both adjusted with *one* stability knob. It's the ideal instrument for dependable, accurate performance on industrial processes with short time lags, such as close-coupled liquid flow, fast pressure and comparable temperature problems.

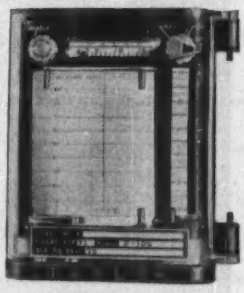
Both Controller and Receiver PLUG IN like a radio tube. All units can be mounted on the panel without welding, without drilling holes. Only one mounting necessary for both controller and recorder or indicator—and these can be changed in 10 seconds. The only piping connections required are air supply, controller output, and to the variable transmitter. All other connections are made automatically, in self-sealing manifold.

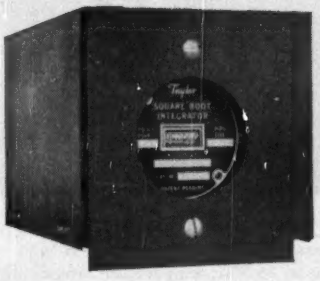


RECEIVE

The TRANSET Indicator has all features of the TRANSET Recorder, but gives no chart record. Easy reading 3½" dial, mounts in same size panel opening as the TRANSET Recorder.

TRANSET Recorder takes fullest advantage of TRANSAIRE Transmitter precision Recorder has automatic-manual unit, remote set-point adjustment, valve position indicator. Takes 4⅜" x 5" panel space. 30 day linear chart, 3 hours visible.





TRANSET Receiving Flow Intigrator also takes just 4⅜" x 5" panel space. It totals the flow of liquids and gases, is available in square root or linear forms. Small size makes it ideal for graphic panels.

*Trade-Mark

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

16 years' use proves PYREX® pipe advantages

Heyden Chemical Corporation, makers of synthetic organics and antibiotics, have used PYREX brand glass pipe since 1937 to eliminate the danger of product contamination, to gain the advantage of visible checks on products in process, and to solve a critical maintenance problem.

The clear visibility PYREX pipe offers is more than a convenience to Heyden. It permits close control and correction of the speed and extent of reactions as they take place, allowing a certainty of results not otherwise attainable.

No product build-up

Heyden's operating experience proves that none of their materials stick to the glass to build up impedance to flow. When cleaning is necessary, it is done simply by flushing the lines with steam.

Plant installation policy requires running PYREX pipe lines out of reach of unskilled workers whenever possible, and instances of breakage have been very rare. Flexible hangers compensate for alignment hazards and the flexibility of the pipe itself allows sufficient deflection to correct what Mr. L. H. Tyler, Department Supervisor, calls the "vagaries of installation."

Mr. Tyler estimates that at least 800 feet of PYREX pipe is in use in the processing areas of the Heyden plant at Fords, N. J. This does not include long outdoor lines between buildings and to loading and disposal facilities, some of which have been in continuous use since 1937.

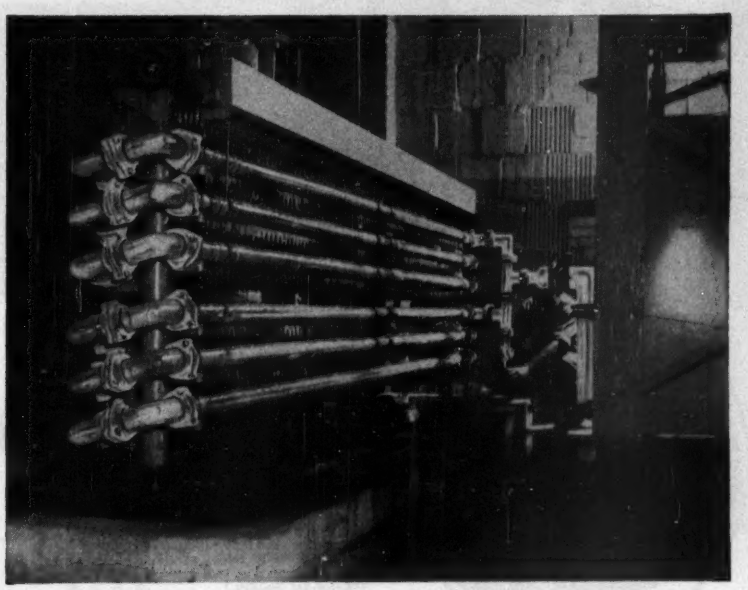
Many applications in plant

There are some two dozen installations in this plant similar to those pictured here, in addition to a number of individual jacketed-pipe condenser units.

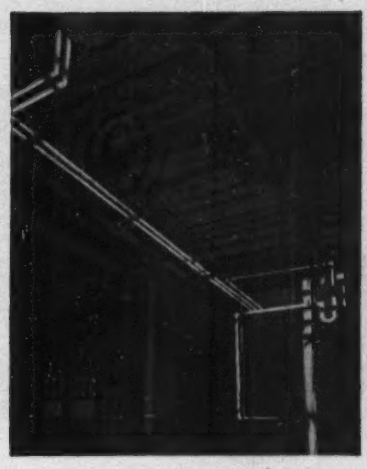
The PYREX pipe distributor nearest you will welcome an opportunity to discuss process fluid handling problems in your plant. He is well informed on the advantages, limitations, and proper installation techniques for PYREX "Double-Tough" glass pipe, and he is backed by the technical experience of Corning engineers. We suggest that you get in touch with him.

Chlorinated aromatics are made in this newest of many reactor and condenser arrangements in Heyden's Fords, N. J. plant. This picture shows one of the reaction kettles in operation. Some of the lines visible above and behind the kettle are 2", 4" and 6" PYREX "Double-Tough" glass pipe which operate at a pressure range of zero to 25 PSI; temperature range: room to 120°C.

in processing fine chemicals



This cascade-type condenser is on the floor above the reactor and condenser installation shown at the left. It consists of twelve lengths of 2″ x 12′ PYREX "Double-Tough" heat exchanger pipe and is equipped with drip fins. Gaskets are Teflon. (Heyden has developed a "Teflon bellows" connector for joints subjected to unusual vibration, such as at pumps.) The operator is taking a sample from the PYREX header which supplies product to the first and fourth runs.



This shows parts of two phases in the purification of acid-bearing toluene. Along the ceiling beam at the upper left a pair of 1″ PYREX pipes lead from outdoor storage tanks to processing equipment on the floor above. The vertical 6″ PYREX open column at the right originates in a kettle on the floor below and supplies a condenser slung from the ceiling to the right of the picture. A 2″ PYREX trap connects to the condenser exit and from this trap a 2″ glass pipe line runs downward under the stairway landing and out to any of a group of outdoor storage tanks or to any of fifteen kettles, depending on requirements.

The PYREX pipe distributors listed below carry the complete line. *Contact the one nearest you:*

BELMONT, CALIFORNIA
Glass Engineering Laboratories

FRESNO 17, CALIFORNIA
Valley Fdy. & Mach. Works

NEW HAVEN, CONNECTICUT
Macalaster Bicknell Company

ATLANTA, GEORGIA
Southern Scientific Company

CHICAGO 44, ILLINOIS
Fred S. Hickey, Inc.

NEW ORLEANS, LOUISIANA
W. H. Curtin & Company

CAMBRIDGE 39, MASS.
Macalaster Bicknell Company

ST. LOUIS 4, MISSOURI
Stemmerich Supply Inc.

LODI, NEW JERSEY
Mooney Brothers Corporation

ALBANY 5, NEW YORK
A. J. Eckert Company

BUFFALO 13, NEW YORK
Buffalo Apparatus Co.

ROCHESTER 3, NEW YORK
Will Corporation

HATBORO, PENNSYLVANIA
Sentinel Glass Company

PITTSBURGH 19, PA.
Fisher Scientific Company

HOUSTON 7, TEXAS
W. H. Curtin & Company

SEATTLE 4, WASHINGTON
Scientific Supplies

TORONTO, ONTARIO, CAN.
Fisher Scientific Co., Ltd.

MONTREAL 3, QUEBEC, CAN.
Fisher Scientific Company, Ltd.

VANCOUVER, B. C.
Scientific Supplies

CORNING GLASS WORKS, CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS
Dept. CE-2, Corning, N. Y.

Please send me the printed information checked below:

- ☐ "Installation Manual" for PYREX brand "Double-Tough" Glass Pipe (PE-3)
- ☐ "PYREX brand Glass Pipe in the Process Industries" (EA-1)
- ☐ "PYREX brand 'Double-Tough' Glass Pipe and Fittings" (EA-3)
- ☐ "PYREX Cascade Coolers" (PE-8)
- ☐ "Plant Equipment Glassware for Process Industries" (EB-1)

Name_____

Title_____

Company_____

Street_____

City_____

Zone_____ State_____

These *EXAMPLES* of *VERSATILITY*

show that DOWNINGTOWN IRON WORKS INC. can help YOU, too

Two of four Steel Shell Condensers with Ampco 8 Heads and Tube Sheets. These condensers were built for export to the Middle East.

One of 4 Fermentors, 12'0" x 22'7" high tangent. 10% Stainless Clad, type 304 Stainless . . . manhole body and connections type 304 Stainless. Each fermentor equipped with coils of 3" O.D. x 14 ft. tubing . . . type 304 Stainless.

One of six carloads of Heat Exchangers, Coolers, Condensers and Reboilers designed and fabricated by our Heat Transfer Division. Materials used consist mainly of Type 304 Stainless Steel.

This condenser is 16" DIA. x 12' tube length; Bundle ¾" O.D. type 316 Stainless tubes; Double tube sheet also of type 316 . . . manufactured by the Heat Transfer Division of DOWNINGTOWN.

One of two all-Aluminum units fabricated by DOWNINGTOWN IRON WORKS, INC. (Welding was performed by the Inert-Gas-Metal-Arc method.)

CORRECT DESIGN—RIGHT MATERIALS

. . . yes, DOWNINGTOWN's experience and research in the fabrication of various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Cupro-Nickel, Aluminum, etc., may be of help to you. We are equipped with the most modern facilities to handle complete jobs, within our limitations, in the correct alloys and methods of fabrication required to assure maximum operating efficiency.

DOWNINGTOWN also maintains a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field. Our Engineering Consultation is at your service to aid you in preparation of plans and specifications for definite jobs.

Useful literature sent upon request on your business letterhead. *Remember:* "Your Needs are Our Specialty!"

New York Office: 30 Church Street

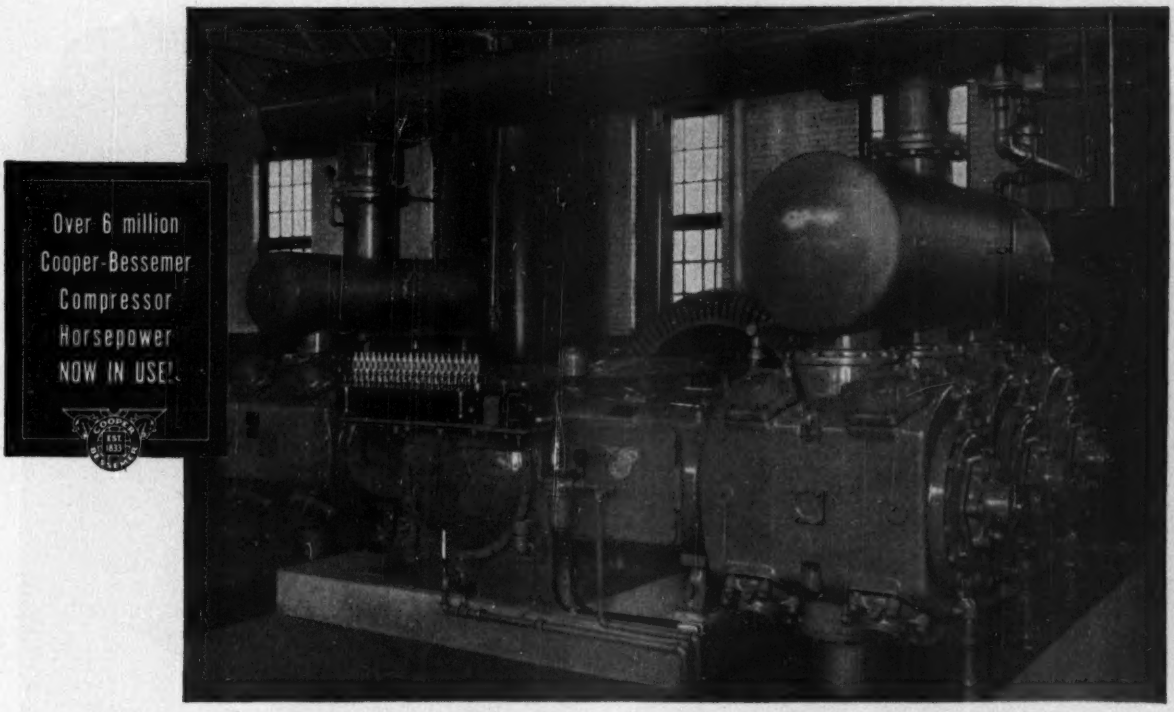
DOWNINGTOWN IRON WORKS, INC.

DOWNINGTOWN-PENNA.

DIVISION OF PRESSED STEEL TANK COMPANY

Hackney

STEEL AND ALLOY PLATE FABRICATION AND HEAT EXCHANGERS



Recently installed in Newark Stove Company plant, Newark, Ohio, this is a Cooper-Bessemer 800 hp Type FM compressor with 5 balanced-opposed compressor cylinders.

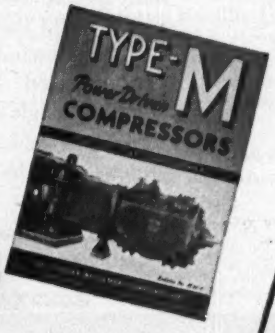
Why Air Costs Less at Newark Stove

Add up the advantages of this modern-type Cooper-Bessemer compressor, and you'll see why it does a *low*-cost job, year in, year out.

For example, with balanced, opposed action, it's the smoothest running compressor money can buy . . . and that means continuous, vibration-free operation with less repair, less maintenance.

For another thing, Cooper-Bessemer design offers unusual compactness. Foundation and piping requirements are correspondingly less. No need for a deep motor pit.

But check up further. Look into the many construction features, found only in Cooper-Bessemers, that are your *best* guarantee of permanent satisfaction.



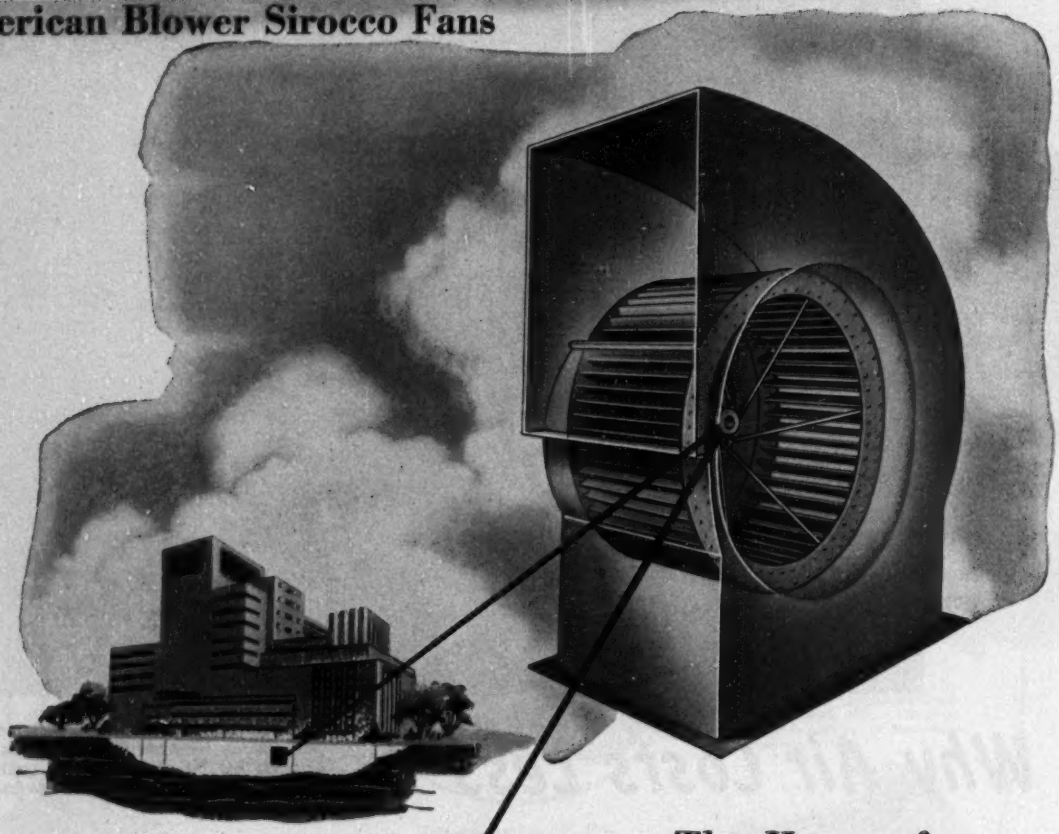
SEND FOR THIS BULLETIN **. . . it gives details and pertinent data on the Cooper-Bessemer power-driven Type M compressors, 350 to 1,000 bhp.**

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. New Orleans, La.

American Blower Sirocco Fans



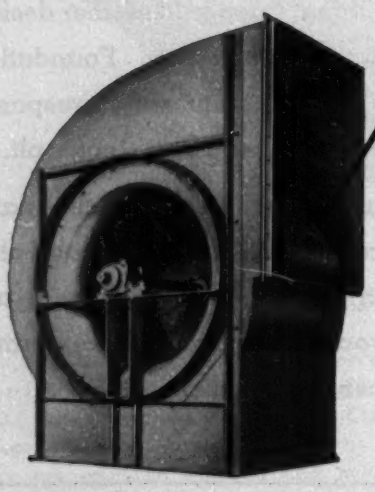
The Heart of Air Conditioning

So quiet it's hardly noticed, so compact it conserves valuable space, so efficient it's actually the heart of this hospital's vital air conditioning system.

American Blower Sirocco Fans occupy less space and deliver more air per revolution than any other type fan. Slower speed means quieter operation, decreased wear, minimum maintenance.

Many thousands of Sirocco Fans have been installed throughout the world since 1908. Over the years many refinements have been included. New methods of construction have been perfected. But these fans still retain the proved Sirocco principle of delivering more air per revolution.

For data on how the Sirocco Fan can be used in your business, call the nearest American Blower Branch Office.



American Blower Series 81 Sirocco Fan. All Sirocco Fan ratings are certified in accordance with the Standard Test Code.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

You can't stop a bullet with a catcher's mitt

You can't stop corrosion with ordinary paints...

it takes BITUMASTIC COATINGS!

CORROSION can't be stopped by ordinary paints or conventional protective coatings. They can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic Coatings can!

BECAUSE the six Bitumastic® Protective Coatings, unlike maintenance paints, are specially formulated from a coal-tar pitch base* that is, for all practical purposes, impervious to water. And when you keep moisture away from an exposed surface, you *stop* corrosion.

BECAUSE Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements—a barrier that is impenetrable.

BECAUSE Bitumastic Coatings provide up to 8 times the film thickness of conventional paint coatings.

BECAUSE Bitumastic Coatings stop corrosion caused by moisture—acid fumes—alkaline fumes—corrosive soil—salt air—heat.

There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.

**Hi-Heat Gray contains heat-resistant metallic base.*

—SEND FOR SET OF FREE BOOKLETS!—

Koppers Company, Inc.
Tar Products Division
Dpt. 159T, Pittsburgh 19, Pa.

Please send me, without charge or obligation, your booklets on corrosion prevention.

Name.....

Address.....

City.....Zone.....State.....

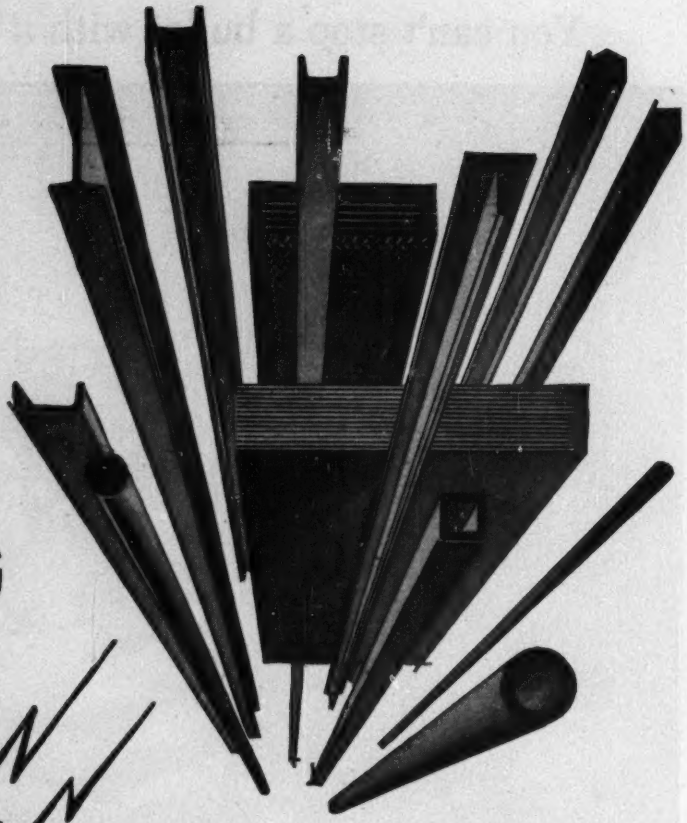
KOPPERS BITUMASTIC PROTECTIVE COATINGS

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

KOPPERS COMPANY, INC., Tar Products Division, Dept. 159-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

STEEL for CHEMICAL PROCESSING



In stock...Prompt shipment

When you call Ryerson for steel, you can be sure of prompt, personal service from the minute your call comes in. With the exception of those few items remaining in short supply, we can fill all your orders quickly from stock on hand. And to assist you on any problem of steel procurement, application or fabrication, the friendly counsel of experienced Ryerson specialists is always yours for the asking.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat-treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
REINFORCING—Bars & Accessories, spirals, wire mesh
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

CALL RYERSON

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SEATTLE • SPOKANE

FEBRUARY 1953 Chemical Engineering

An Engineer's View of the Dollar

What's happening to the dollar? How can you estimate costs and measure performance in constant units? How can engineers fight inflation?

SYDNEY STEELE

In the New Yorker Magazine's 25th anniversary album there appeared a cartoon of a slightly over-stuffed gentleman undergoing a physcial examination. He asks, "When you say that I'm sound as a dollar, Doctor, just what do you mean?"

Let's take the cartoon caption seriously—it will help our discussion of the dollar as an engineering unit.

WHAT ARE THE CHARACTERISTICS OF ENGINEERING UNITS?

In the first place, all engineering units are defined precisely. For example, the U. S. gallon contains 231 cu. in., or 8.3389 lb. of distilled water at its maximum density and with the barometer at 30 in. Hg; and a Btu. is the amount of heat required to raise the temperature of 1 lb. of water 1 deg. F. under stated conditions of temperature and pressure. These are typical engineering units defined as precisely as our present knowledge permits.

The second characteristic of engineering units is that they remain essentially constant from year to year.

The third characteristic of engineering units is that they can be translated exactly into comparable overseas engineering units, which are themselves equally precisely defined. For example, the U. S. gallon is converted to liters by a factor of 3.78533, and the Btu. is converted to gram-calories by multiplying by 252.

SYDNEY STEELE, *a graduate of Cambridge University, is director of planning for Atlas Powder Co., Wilmington, Del. Before joining Atlas, he was with Imperial Chemical Industries, Du Pont and Fischer & Porter.*

WHAT ARE THE CHARACTERISTICS OF THE DOLLAR?

Webster's New Collegiate Dictionary defines the "standard dollar" of the U. S. as: "The monetary unit; before 1934 a dollar of 25.8 grains of gold, .900 fine; since January 31, 1934, a dollar of 15.238 grains of gold, .900 fine."

The dollar is hardly constant from year to year, as shown below. If the present trend continues, the consumers' dollar will be worth 10 c. by 1990.

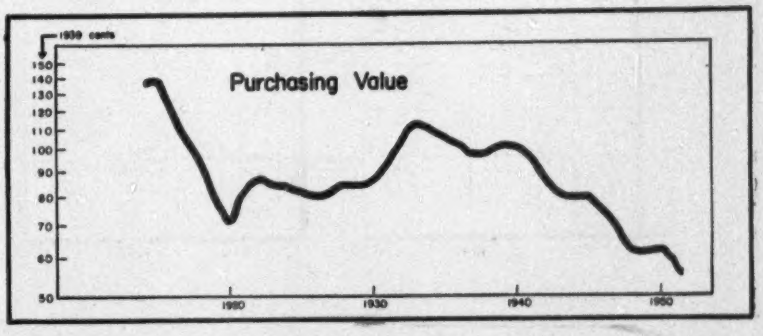
The dollar can be converted into overseas currencies, but the conversion factors vary frequently. Not only does the dollar itself vary in value, but other currencies fluctuate even more widely than the dollar. According to Dr. Franz Pick, during the past 13 years the currencies of 13 countries (serving over 700 million people) have been destroyed by complete depreciation. During the same period of time 23 other principal currencies, which were the trading, wage and savings units of almost another 700 million human beings, have lost 50 percent and more of their value.

Dr. Pick sums up by saying that more than 92 percent of all human beings now living have seen most of their savings annihilated by devaluation.

CONSTANT VS. CURRENT DOLLARS

Since the politicians have failed in setting up a stable monetary unit, let us do two things. Let us agree to use a constant dollar as a yardstick, and then see what are some of the results of using it and the "current" or "unconstant" dollar in business and engineering activities.

The constant dollar is assumed to have the purchasing power of the January 1939 consumers' dollar, equivalent to 100 1939 cents. (In terms of this constant dollar, the consumers'



dollar current during the year 1951 was worth 56 cents.)

WHY THE CONSUMERS' DOLLAR?

Perhaps a word should be said here about selecting the purchasing power of the consumers' dollar as a basis for our constant dollar. The arguments used by Ralph C. Jones of Yale University (in a study of the steel industry, referred to later) seem reasonable and compelling. He says:

"Although on first thought a consumers' index may not seem appropriate for an analysis of the steel industry, there are strong arguments in its favor. The fact that everyone must pay consumers' prices makes this index a widely accepted and generally understood standard with which to measure changes in the value of the dollar. The principal thing which steel companies buy directly and indirectly, moreover, is human labor, and no better index for computing real wages or real wage costs seems to be available. The same index is acceptable also for that portion of revenue which is currently distributed to investors.

"Indeed, it is reasonable and appropriate for all elements in the financial statements, since the purpose here is not to find the best index for each class of data, but rather to express all data in terms of a common standard. Only thus can all the figures on balance sheets and income statements be made internally consistent and comparable with similar statements for other years."

Although Dr. Jones was speaking of the steel industry his arguments appear sufficiently compelling to apply to the economy as a whole, when our objective is to express many data in terms of a common unit. In what follows, data in terms of current dollars are converted to constant dollars by multiplying the current dollar data by the purchasing power of those dollars in terms of January 1939.

LOOK AT CONSTRUCTION COSTS

Perhaps the first area in which the practicing engineer notes the effect of an unconstant dollar is in his estimates of construction costs. It's no exaggeration to describe these estimates as the bane of project engineering departments (and of top managements) for more than ten years. How many construction cost estimates have been "right" during this period?

Note the graph on p. 160, showing the purchasing value of the construction dollar; it is derived from the *Engineering News-Record* index of construction costs. If the present trend continues, the construction dollar will be worth 10c. by 1975.

The Du Pont comparative consolidated income account for 1947 included "provision for excessive construction costs to the extent of $20,900,000." This reduction of net income was the company's way of preventing over-statement of earnings through inadequate depreciation charges permitted by the Internal Revenue Bureau.

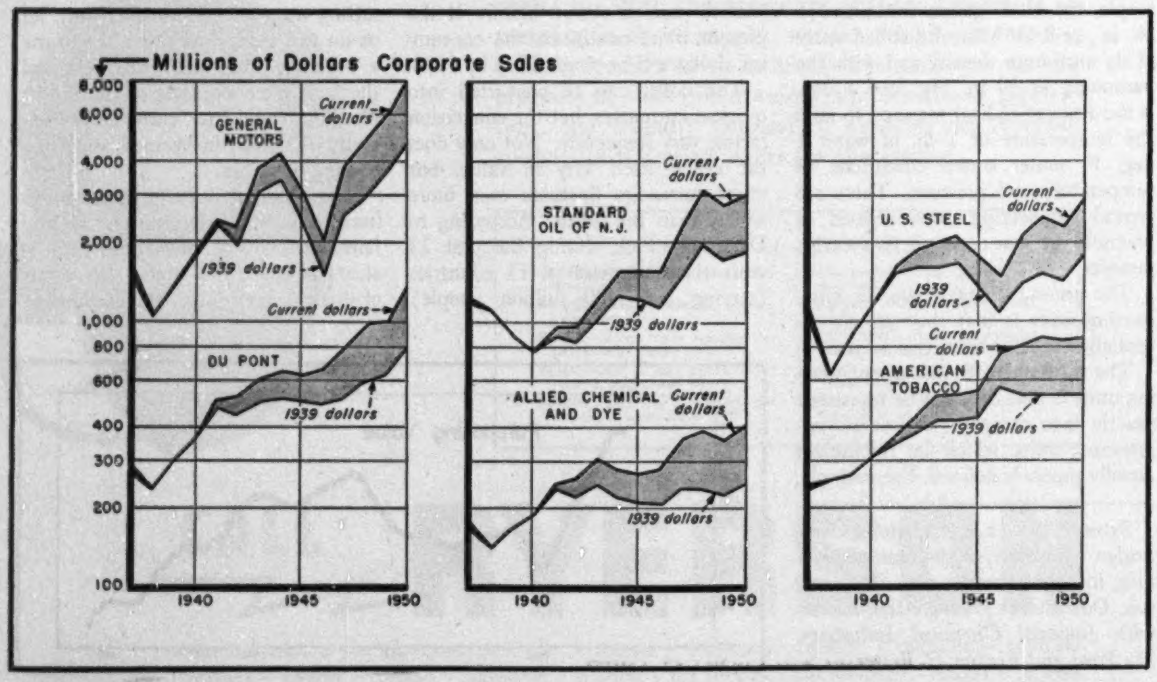
HOW DOES THE UNCONSTANT DOLLAR AFFECT CAPITAL ANND PROFITS?

Dr. Jones studied the effect of inflation on nine steel companies doing 80 percent of the nation's steel business and published his findings in the January 1949 issue of the *Journal of Accountancy*. The table on the opposite page highlights some of the contrasts found in this study.

Corporate sales are expressed in terms of current dollars, and progress is measured usually by sales volume in terms of current dollars. In the charts below, sales for six corporations are plotted both in current and constant (1939) dollars. No attempt has been made to correct for product price rises.

The constant dollar figures are a broad measure of real progress in terms of quantities of automobiles, chemicals, oil, steel and tobacco distributed by these enterprises. Note the widening spread between "current dollar" and "constant dollar" lines, sufficient to convert some apparent gains into little more than preservation of the status quo.

Analysis in terms of current and



How Inflation Affects Capital and Profits

IN TERMS OF CURRENT DOLLARS, NINE STEEL COMPANIES REPORT:

Dividends—Earned by a wide margin every year.

Capital Increase—$543 million income retained in the business.

Income for 1946—$200 million (before transfers from reserves).

Fixed Assets—Decreased 6 percent during seven years.

Depreciation Cost for 1940-47—$46 million (excess over additions to plant).*

IN TERMS OF 1935-39 DOLLARS, DR. R. C. JONES SHOWS:

Dividends—Not earned in any year since 1941.

Capital Decrease—$409 million paid out of capital for dividends, interest and income taxes.

Loss for 1946—$88 million (before transfers from reserves). Equivalent to 123 million 1946 dollars.

Fixed Assets—Decreased 19 percent during seven years.

Depreciation Cost for 1940-47—$400 million (excess over additions to plant).*

*Due primarily to amortization of emergency facilities during the war period.

constant dollars can be applied also to other factors, such as wages and salaries, advertising expenditures and military budgets, with equally interesting results.

HOW BAD IS INFLATION?

What we have been discussing, obviously, are the effects of inflation, from the viewpoint of engineers accustomed to reasonably exact measurements in terms of constant units. To engineers, inflation has many of the characteristics of Alice's looking-glass world. This analogy heightens when we consult some of the writers on the subject.

In the August 1952 issue of Harper's Magazine, Sumner H. Slichter wrote an article entitled, "How Bad Is Inflation?" Prof. Slichter favors a slow rise in prices, and goes on to say:

"Of course, even a small increase of 2 or 3 percent a year, though hardly enough to be noticed at any given moment, is sufficient to cause substantial injustice. For example, a rise of only 2 percent a year will reduce the purchasing power of the dollar by 45 percent in 30 years, so that the pension or life insurance that one started to buy in one's youth will have lost nearly half its purchasing power before one has reached the age of retirement."

Referring again to p. 157, note that in the United States between 1933 and 1951, a period of only 18 years, we have lost over 50 percent of the purchasing power of the consumers' dollar. By Professor Slichter's own standard, a 45 percent reduction in 30 years is a "substantial injustice." How would he describe over 50 percent in 18 years? Or 44 percent in the 12 years since 1939?

Toward the end of his article, Prof. Slichter says, "The net advantage to the country of a slowly rising price level over a stable one is the greater amount of employment, and hence the greater amount of production and the higher standard of consumption, that are made possible by a slowly advancing price level."

NEVER HAD IT SO GOOD?

To get a general idea of the "higher standard of consumption," the gross national product of the United States (defined as total value at market prices of all goods produced by the nation's economy, including governmental agencies) expressed for each year in terms of the January 1939 dollar, has been divided by the population of the country for that year. This was done to get a rough measure of the "higher standard of consumption" supposed to follow "gradual" inflation.

The result is shown on p. 160; it's not difficult to decide whether there is any firm, long-term correlation between trends in the purchasing value of the dollar and a 40-year trend in gross national product per person, which amounts to an annual increase of about 1.7 percent.

Henry Hazlitt, commenting in *Newsweek* on Prof. Slichter's advocacy of continuous inflation to combat communism, quotes from the late Lord Keynes, who wrote, years ago:

"Lenin is said to have declared that the best way to destroy the capitalist system was to debauch the currency. Lenin was certainly right. The process engages all the hidden forces of economic law on the side of destruction and does it in a manner which not one man in a million is able to diagnose."

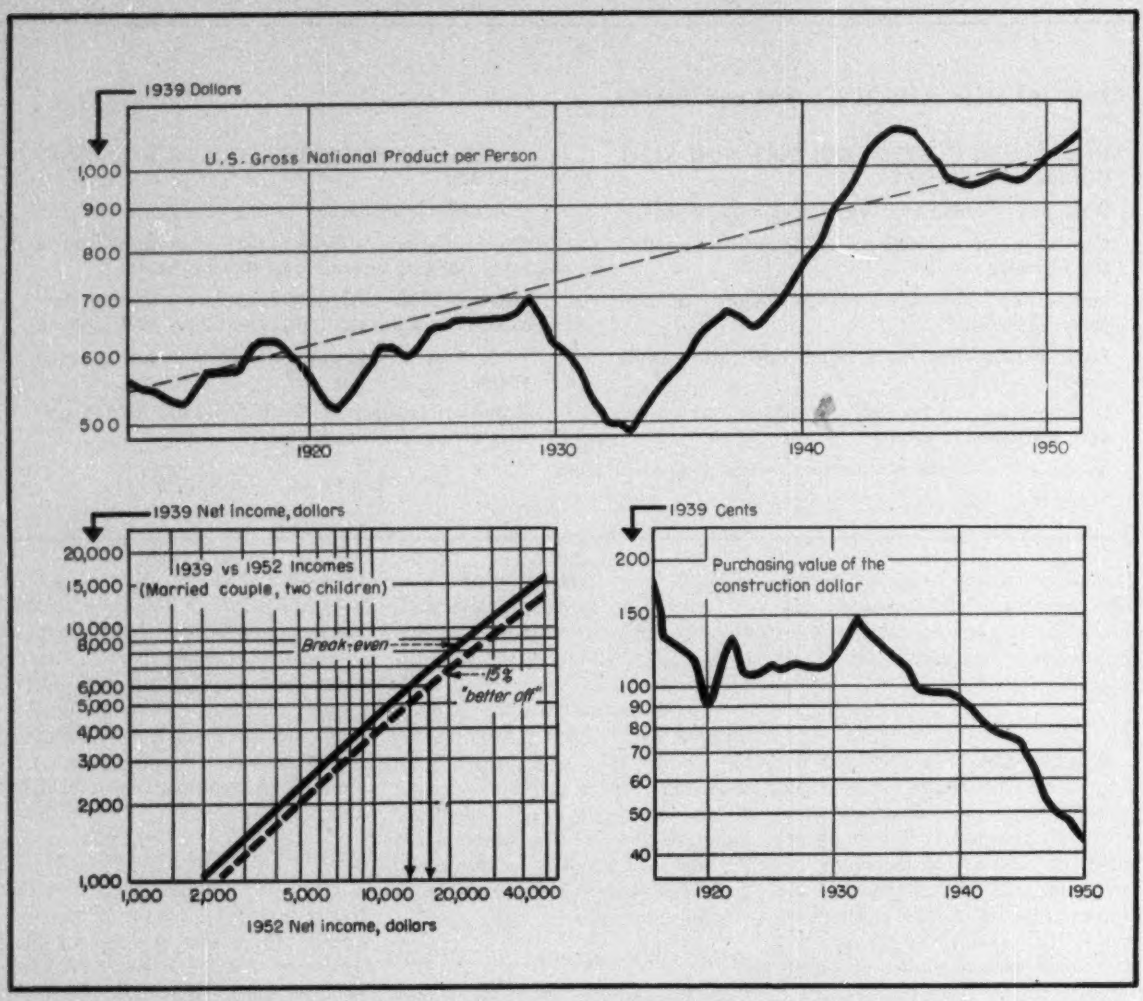
INCOME VS. OUTGO

Here is additional evidence on the theory that "all is for the best in this best of all possible worlds," or that "we never had it so good." The Bureau of Labor Statistics, quoted in the Wall Street Journal of August 18, 1952, found that in 1950 the average city dweller was $400 in the red. Income after taxes in 1950 averaged $4,300, but spending came to an average of $4,700.

A century ago Mr. Micawber summarized this situation in these immortal words: "Annual income twenty pounds, annual expenditure nineteen nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds ought and six, result misery."

This BLS release was made much of by Republican campaigners, and the Bureau was asked to "clarify" the situation. *Newsweek* tells the rest of the story:

"So the BLS is releasing some new statistics. It said it had made some mistakes. In figuring outgo, it had ignored the fact that maybe 60 percent of insurance payments were savings, and this made a $90 difference.



It had made another error just involving simple arithmetic, which made a $150 difference. So a more correct spending figure was really $4,460 instead of $4,700.

"Also, in figuring the income, it hadn't done right by inheritances, which it figured added $50. And besides, people sometimes fib about their total income, so, figuring in 7 percent worth of liars, that added, say, another $300. All of which made the income figure really $4,650 instead of $4,300.

"According to this, the average urban family came out $190 to the good in 1950."

ARE WE BETTER OFF?

Herbert J. Miller, executive director of the Tax Foundation, addressed the Government Research Association recently on the subject, "Are We Better Off?" Some of Dr. Miller's findings and plotted above (left). Note that a married couple with two children having a 1939 net income of $6,000 would need about $14,000 in 1952 to break even, and $17,000 to be 15 percent better off. If their 1939 net income was $4,600 they would require about $10,000 now to break even and $12,000 to be 15 percent better off.

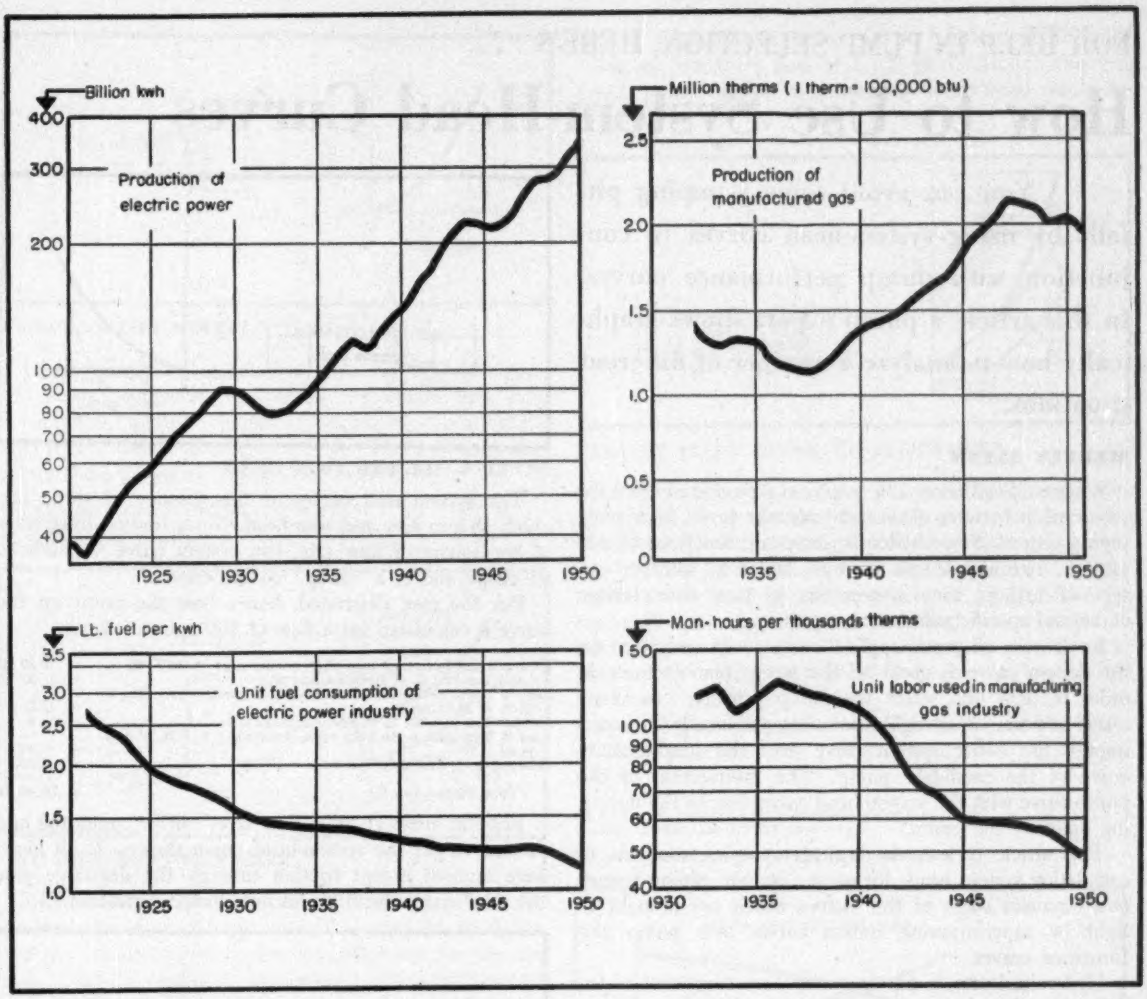
Dr. Miller's study showed also that the net worth in constant dollars per family decreased 12½ percent from 1939 to 1951. Net worth is debt subtracted from assets. Assets include consumer's durable goods, non-farm residences, farm structures, farm land, farm inventories, non-military government assets and liquid assets such as currency, bank deposits, insurance and corporate securities. Debt includes mortgage debt to institutions on one- to four-family non-farm dwellings, consumer credit, farm mortgage debt and all government debt.

WHAT CAN WE DO ABOUT IT?

As engineers, we should sharpen our engineering wits and think more in terms of basic costs. Let us not think only in terms of dollars, pesos, pounds sterling, cruzeriros, francs and other national currencies. Let us put more emphasis on man-hours, materials and utilities; in measuring industrial performance these are the things we think of first.

Our measures of production are equally concrete—the number of articles produced, weight of products made, ton-miles of freight handled. These are the true criteria of industrial performance and are independent of fluctuating currencies. They permit thorough and meaningful comparison between any number of years for which adequate data are available. These basic costs translate directly into the units used all over the world, and the conversion factors don't vary from year to year.

If we think principally in terms of basic costs—man-hours of labor, kilo-



watt-hours of electric energy, tons of coal, cubic feet of gas, gallons of water, weights of raw materials—the way is opened for basic cost reduction. There are many sources of information on basic cost reduction, and a condensed check-list will be found in Staniar's "Plant Engineering Handbook."

The best way in which engineers can do their part to preserve and raise material standards of living is to think in terms of basic costs and to work for their reduction.

EXAMPLES OF BASIC COST REDUCTION

The above graph shows how the electric power industry has reduced its average consumption of coal (and equivalent oil and gas) from nearly 3 lb. per kwh. in 1921 to a little over 1 lb. in 1951. The best plants today are producing a kilowatt-hour on ¾ lb. of coal and the best designs will make it for 0.7 lb.

Not only have fuel basic costs been reduced but, according to J. H. Foote,* capital investment per kilowatt has declined, in terms of constant dollars, during the past twelve years. Moreover, the average price per kwh. sold to the residential customer has dropped, *even in terms of current dollars.* Mr. Foote adds: "This extraordinary performance has been made possible through the integration of engineering and technical improvements in design, construction and operation."

The second example illustrated is taken from the manufactured gas industry. Note that almost 130 man-hr. of labor were required to produce 1,000 therms 16 years ago, compared with about 50 in 1951.

Perhaps each of us can think of an example of basic cost reduction from his own experience. Without these engineering achievements the consumers' dollar would be worth considerably less than its current 50-odd cents.

RUN TWICE AS FAST

Returning to the earlier analogy with Alice's looking-glass world, aren't today's engineers really like Alice in the following exchange with the Red Queen? (Alice and the Red Queen had been running very fast without getting anywhere.)

"Well, in our country," said Alice, still panting a little, "you'd generally get to somewhere else if you ran very fast for a long time as we've been doing."

"A slow sort of country!" said the Red Queen. "Now here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"

* Vice president, Commonwealth Services, Inc., in an address to the Edison Electric Institute, June 3, 1952, in Cleveland.

FOR HELP IN PUMP SELECTION, HERE'S . . .

How to Use System-Head Curves

You can avoid some pumping pitfalls by using system-head curves in conjunction with pump performance curves. In this article a pump expert shows graphically how to analyze a number of different situations.

MELVIN MANN

A system-head curve is a graphical representation of the relationship between flow and hydraulic losses in a given piping system. Since hydraulic losses are functions of rate of flow, size and length of pipe, and size, number and type of fittings, each system has its own characteristic curve and specific values.

In virtually all pump applications at least one point on the system curve is given to the pump manufacturer in order to help him select the pump properly. In many cases, however, it is highly desirable graphically to superimpose the entire system curve over the head-capacity curve of the candidate pump. The intersection of the pump curve with the system-head curve defines the operating point of the pump.

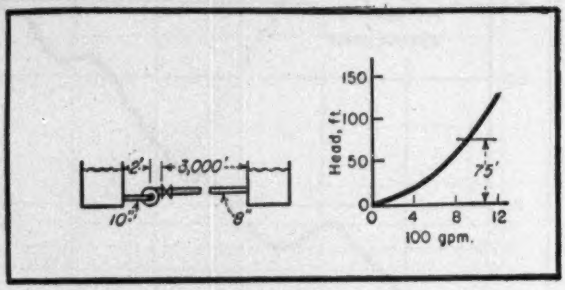
This article reviews, by typical examples, methods of calculating system heads for some common piping layouts and discusses some of the factors which are brought to light by superimposing system curves over pump performance curves.

Hydraulic losses in piping systems are composed of the following: Pipe friction losses; fitting losses (valves, elbows, etc.); entrance and exit losses (these normally occur at the beginning and end of a pipeline, respectively); losses due to change in pipe size by sudden or gradual enlargement or reduction in diameter.

In the application of low-head, high-capacity pumps, such as mixed-flow or axial-flow pumps, it is imperative that, when applicable, each of these losses be accurately accounted for, because they usually represent a significant fraction of the total system head. However, in applications involving relatively high static lift and/or relatively high pipe friction losses (long lines) it is usually unnecessary to account for losses other than pipe friction, since these other losses are an insignificant portion of the total head.

Except for the first two examples to follow, we shall take into account only losses resulting from pipe friction. However, in actual practice each application should be checked to see what is the order of magnitude of the various hydraulic losses. A decision can then be made as to what losses should be accounted for and what ones can be neglected.

MELVIN MANN is chief proposal engineer of Peerless Pump Div., Food Machinery and Chemical Corp., Los Angeles.



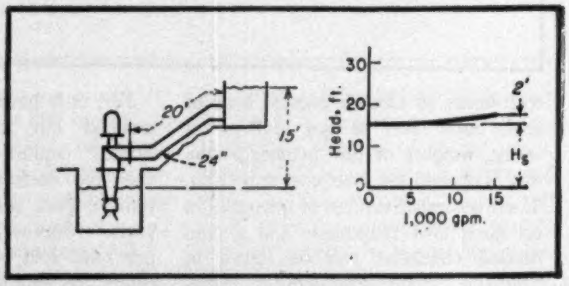
NO LIFT–ALL FRICTION HEAD

The system-head curve, in the absence of static lift, starts at zero flow and zero head. Since friction losses vary as the square of flow rate, this system curve is parabolic in shape and is a "steep" system curve.

For the case illustrated, here's how the point on the curve is calculated for a flow of 900 gpm. of water:

Entrance loss from tank into 10-in. suction pipe = $0.5V^2/2g$	= 0.10 ft.
Friction loss in 2 ft. of 10-in. suction pipe	= 0.02
Loss in 10-in. 90-deg. elbow connected to pump (equivalent to 25 ft. of 10-in. pipe)	= 0.2
Friction loss in 3,000 ft. of 8-in. discharge pipe	= 74.5
Loss in 8-in. gate valve fully open (equivalent to 5 ft. of 8-in. pipe)	= 0.12
Exit loss from 8-in. pipe into tank = $V^2/2g$	= 0.52
Total friction loss H_f	= 75.46 ft.

Friction losses at other flow rates can be computed and plotted to get the system-head curve shown. If all losses were ignored except friction through the discharge pipe the total system head would not change significantly.



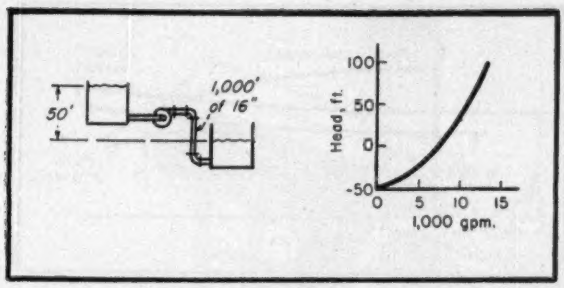
MOSTLY LIFT–LITTLE FRICTION HEAD

The system-head curve here starts at the static lift H_s and zero flow. Since, by assumption, friction loss H_f is relatively small compared to H_s, we get a "flat" system curve. For the case illustrated, here is the calculation of H_f for a flow of 15,000 gpm.:

Friction loss in 20 ft. of 24-in. pipe	= 0.4 ft.
Exit loss from 24-in. pipe into tank = $V^2/2g$	= 1.6
Total friction loss H_f	= 2.0 ft.

In this example almost 90 percent of the total head of 17 ft. at 15,000 gpm. consists of static lift. However, it should be noted that neglecting the friction and exit losses would result in an appreciable error.

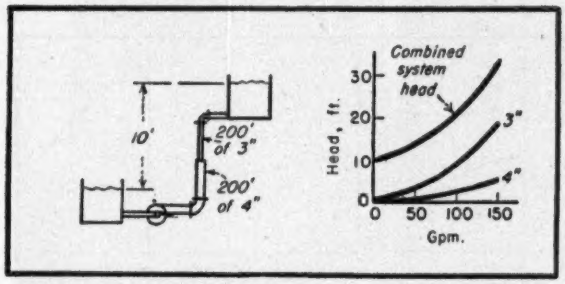
A combination of these two cases is encountered quite often, i.e., where both friction head and static lift are appreciable. The system-head curve is similar to that of the first case with the addition of the static lift.



NEGATIVE LIFT (GRAVITY HEAD)

In this particular installation flows up to 7,200 gpm. will occur by gravity head alone. To obtain flow rates beyond this, however, requires a pump to overcome the pipe friction losses in excess of 50 ft. The following data define three points on the system-head curve:

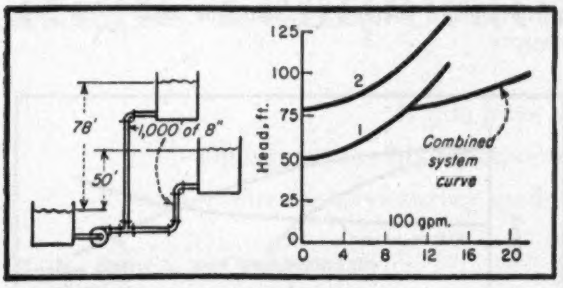
At 5,000 gpm., friction loss in 1,000 ft. of 16-in. pipe	= 25 ft.
At 7,200 gpm., friction loss = available gravity head	= 50
At 13,000 gpm., friction loss	= 150



TWO DIFFERENT PIPE SIZES

Friction losses vs. flow rate are plotted independently for the two pipe sizes. At any given flow rate the total friction loss for the system is the combined loss for the two lines. Thus the combined system curve represents the sum of static lift and the friction losses for all portions of the line.

At 150 gpm., friction loss H_f in 200 ft. of 4-in. pipe	= 5 ft.
At 150 gpm., friction loss H_f in 200 ft. of 3-in. pipe	= 19
Static lift H_s	= 10
Total head H at 150 gpm.	= 34 ft.

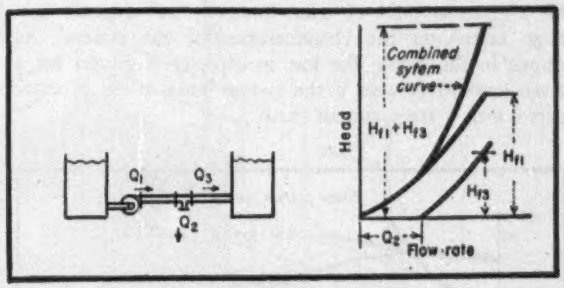


TWO DIFFERENT STATIC LIFTS

System curves are plotted independently for the two lines. The total system curve is then obtained by adding flow rates for the two lines at the same head.

At 550 gpm., friction loss in 1,000 ft. of 8-in. pipe	= 10 ft.
At 1,150 gpm., friction loss	= 38
At 1,150 gpm., friction + lift in Line 1 = 38 + 50	= 88
At 550 gpm., friction + lift in Line 2 = 10 + 78	= 88

Therefore, the flow rate for the total or combined system at a head of 88 ft. is 550 + 1,150 = 1,700 gpm. Thus, to produce a flow of 1,700 gpm. through this system a pump capable of generating 88 ft. head would be required.



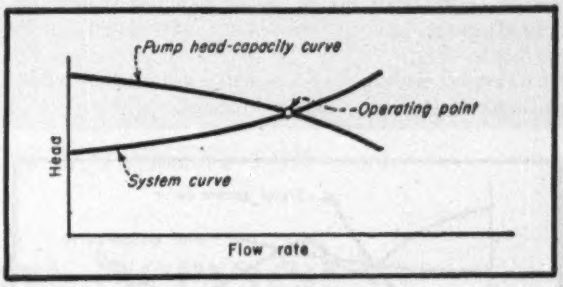
PART OF FLOW DIVERTED ELSEWHERE

In this case we assume that the quantity of liquid being tapped off at the intermediate point is constant.

Friction loss vs. flow rate is plotted in the regular manner for Line 1. The curve for Line 3 is displaced to the right at zero head by an amount equal to Q_2, since Q_2 represents the quantity passing through Lines 1 and 2 but not through Line 3. The combined system curve is obtained by adding, at a given flow rate, the head losses for Lines 1 and 3.

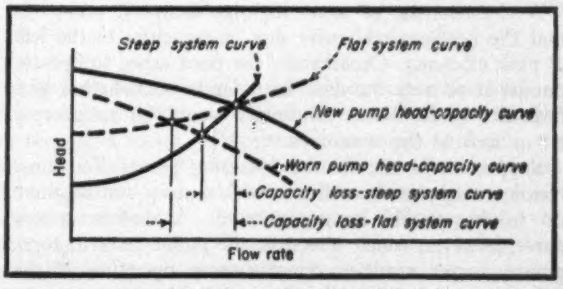
Assume Q_2 is 300 gpm., Line 1 is composed of 500 ft. of 10-in. pipe and Line 3 is composed of 50 ft. of 6-in. pipe:

At 1,500 gpm. through Line 1, friction loss for Line 1	= 11 ft.
Friction loss for Line 3 (1,200 gpm.)	= 8
Total friction loss at 1,500 gpm. pump delivery	= 19 ft.



DEFINING THE OPERATING POINT

Superimposing the system curve on the pump performance curve shows at what point the pump will operate. The shape or slope of both system curve and pump curve are significant in certain applications, as shown in several examples following.

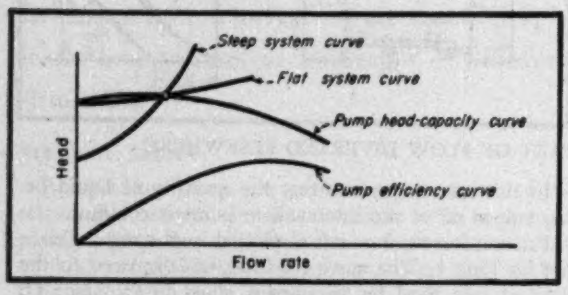


EFFECT OF PUMP WEAR ON CAPACITY

EFFECT OF PUMP WEAR ON CAPACITY

(See graph on preceding page)

We are all aware that when a pump wears there is certain to be a loss in performance. The amount of loss for a given amount of wear, however, will depend to a large extent on the characteristics of the system. As shown in the graph, the loss in capacity is greater for a given amount of wear if the system curve is flat as compared with a steep system curve.

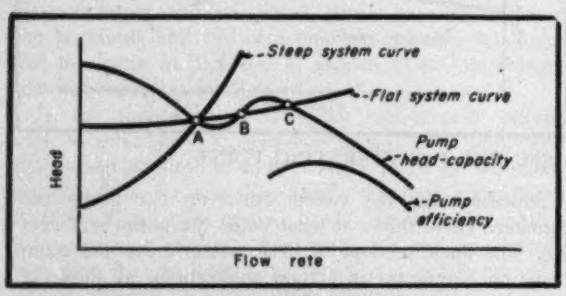


LOW-SPEED PUMP NEAR SHUT-OFF

A characteristic of low-specific-speed pumps is a relatively flat head-capacity curve at capacities near shut-off. Occasionally it is necessary to pick such a pump because of a high-head, low-flow requirement. (Ordinarily pumps are physically capable of operating continuously near shut-off.) If this is the case the system curve should certainly be examined before specifying the pump.

It is evident from the curves that a shallow or flat system curve in conjunction with a flat pump curve can lead to performance trouble if the pump is slightly off in head-capacity or if the system curve is calculated slightly too low.

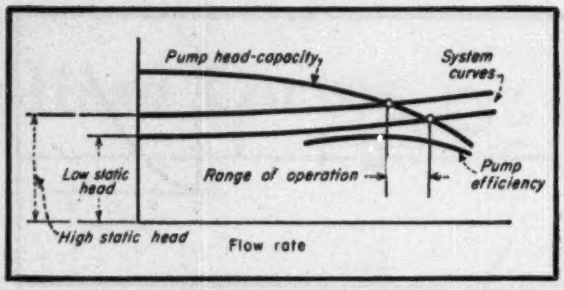
Obviously, with a steep system curve no hydraulic performance trouble would be expected.



HIGH-SPEED PUMP NEAR THE DIP

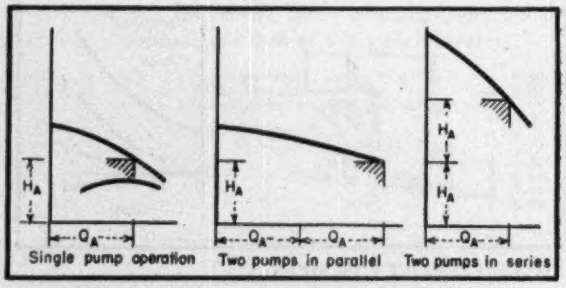
A characteristic of some high-specific-speed pumps is that the head-capacity curve dips at capacities to the left of peak efficiency. Occasionally the need arises to operate pumps at or near the dip. In order to see whether performance under these conditions would be satisfactory let us look at the system curve.

Suppose A is the desired operating point. For some transient high head condition, with a steep system curve no trouble should be encountered. A shallow system curve, however, which intersects the pump curve at three points, might result in unsatisfactory operation if the pump hunted between the three capacities.



VARIATIONS IN THE SYSTEM HEAD

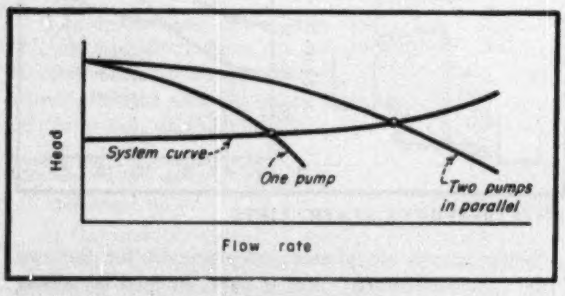
System demand can vary because of variations in suction or discharge surface levels or greater pipe friction because of increased pipe surface roughness. The conditions shown in the graph, where static head is varied, represent a favorable operating range as far as the efficiency of this particular pump is concerned. The curves also graphically illustrate the magnitude of drop in system flow rate when high head condition occurs.



PARALLEL OR SERIES OPERATION

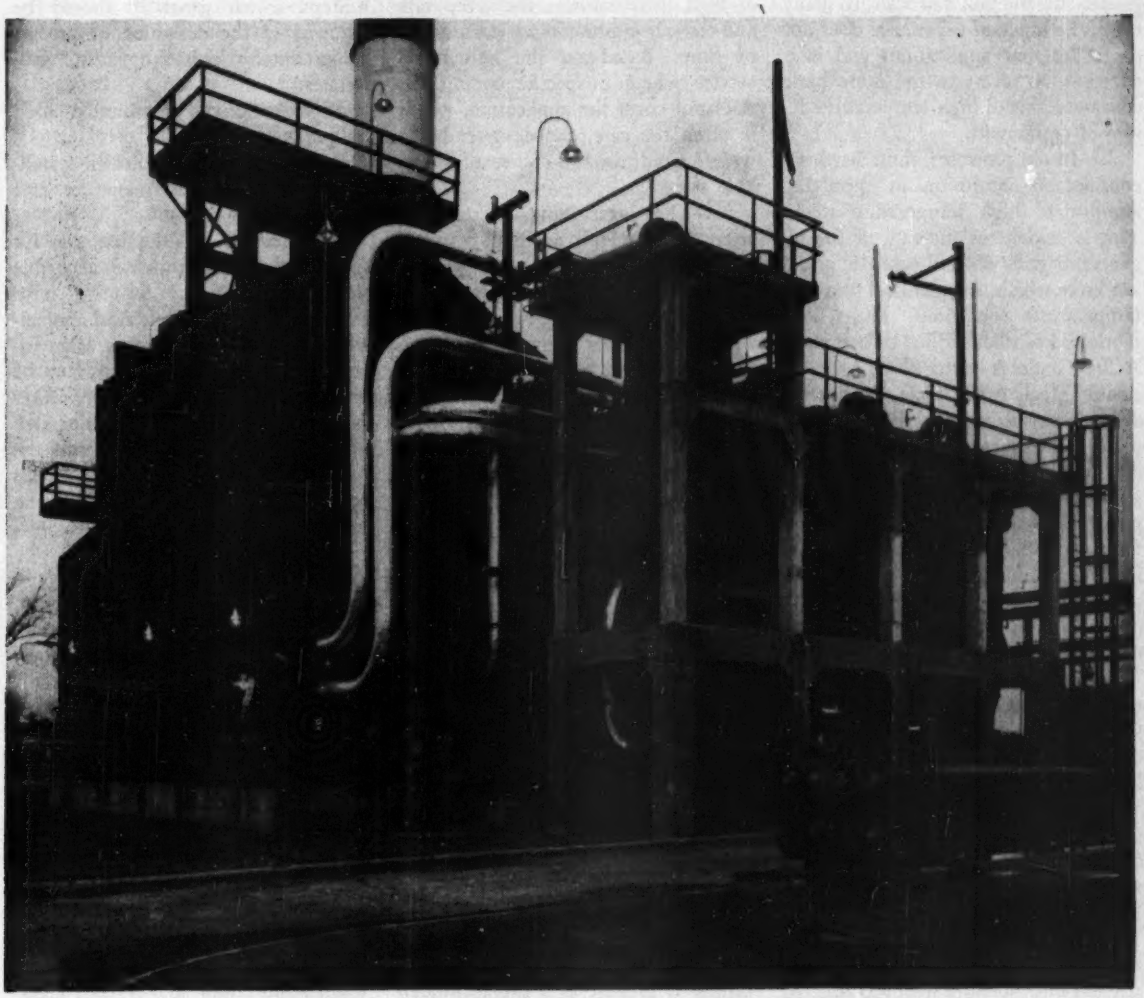
Frequently where there is a wide range in demand two or more pumps may be operated in parallel or series to satisfy the high demand, with just one of the pumps used for low demands. For proper specification of the pumps and evaluation of their performance under various conditions, the system curve should be used in conjunction with the composite pump performance curves.

For pumps in parallel, performance is obtained by adding the capacities at the same head. For pumps in series, performance is obtained by adding the heads at the same capacity.



PUMP PERFORMANCE IN PARALLEL

Superimposing the system curve on the pump performance curves clearly indicates what flow rates can be expected and at what heads each of the pumps will be operating.



SELECTING MATERIALS AND DESIGNING EQUIPMENT FOR . . .

High Temperature Service

If you have a problem of selecting materials and designing equipment for high temperature service, chances are you will profit by this comprehensive survey made by a leading design firm for its own guidance.

R. M. BRACA and R. MERIMS

Recent widespread use of high-temperature processes in petroleum and chemical plants has brought attention to the problems of specifying suitable heat-resistant steels—from both an economic and service point of view—and the problems of forming a sound basis for the mechanical design of equipment exposed to high temperatures. High-temperature processes include catalytic cracking and reforming of petroleum fractions, thermal cracking of light hydrocarbons, synthesis gas and hydrogen preparation by direct oxidation and reforming, Fischer-Tropsch and ammonia synthesis.

• Problems with the selection of metals suitable for high temperature equipment have arisen in three ways:

1.—In new processes, it has been necessary to use previous experience from analogous situations to specify

MIKE BRACA AND BOB MERIMS *are process design engineers with the Foster Wheeler Corp., New York, N. Y.*

proper construction materials. In many cases, the range of experience does not cover the new applications and it is necessary to revert to the more basic considerations of high temperature design of equipment.

2.—In old processes, there has been considerable confusion in specifying appropriate high temperature steels. This is evident in the case of the regenerator grids of fluid catalytic cracking units which, for identical pressure-temperature conditions, have been fabricated of silicon-killed carbon steel, A-201 Grade A plate, carbon molybdenum steel, A-204 plate, 2¼ percent chromium-½ percent molybdenum steel plate, 5 percent chromium-½ percent molybdenum steel plate and 18 percent Cr-8 percent Ni stainless steel plate. Even if metallurgical considerations show that each selection is satisfactory, economic study would definitely show that one or possibly two materials would involve a lower cost than the others.

3.—The tight materials situation existing at this time has made it necessary to make substitutions of materials on short notice after the equipment has been completely designed. For example, on many occasions 12 percent chromium steel has been substituted for 5 percent chromium-½ percent molybdenum steel because of the similarity in creep strength in the 1,100-1,200 deg. F. temperature range. On the other hand, 7 percent chromium-½ percent molybdenum steel was rejected as a substitute for 5 percent chromium-½ percent molybdenum steel because at the service temperature of 1,200 deg. F. the proposed substitute had only two-thirds the long term creep strength of the latter material.

• Design of equipment for high temperatures is unique in two particulars:

1.—Metals at high temperatures undergo creep. The need for minimizing it varies with the application. There are two basic criteria of design at high temperatures: the creep rate and creep to rupture in a given amount of time. Based on the anticipated service where a specific code stress does not cover the application, which is often the case, the designer has a wide latitude in the choice of allowable stress.

2.—The logarithmic decrease in strength of metals at high temperatures with increased temperature (which is not a problem at lower temperatures since there is no decrease in the allowable strength of carbon steel up to 650 deg. F.), requires a careful scrutiny of design conditions as they relate to operations. Arbitrary increases of design over operating conditions in the order of 100 deg. F. will seriously affect the cost of equipment.

• Steps which generally should be followed in the designing of process equipment for high temperature service are:

1.—Selection of a suitable high temperature steel;

2.—Specification of design conditions of pressure, temperature and loadings; and

3.—Selection of the criteria for specifying the appropriate allowable stresses.

The atmosphere, physical properties, and economics fix to a large extent the type of steels that may be used in a particular service. Other factors depend on the anticipated operation of the equipment and the codes governing the design of this equipment under conditions of operation.

Metallurgy Is the First Consideration

A number of considerations enter into the selection of steels for high temperature service. The steel must be adequate for the service from a metallurgical standpoint, and its use must be justified economically.

Structures of steels which are important in elevated temperature applications may be reduced to two main categories. These are (1) ferrite plus iron carbide, and (2) austenite in which the carbon is completely dissolved or may be present as chromium carbide. Martensite, in which the carbon is present as a supersaturated constituent, is of interest in the case of air hardening of steels during welding and hot forming operations.

Iron carbide, generally known as cementite, appears in ferrite as a separate distinguishable constituent. There are many forms ranging from thin lamellar plates in intimate mixtures with pure ferrite (as found in pearlite structures) to globular agglomerates (found in spheroidized carbon steels). The solubility of carbon in ferritic carbon steels at room temperature is less than 0.01 precent, so that ferrite may be considered to be practically pure iron. High temperature physical properties of carbon steels vary little with carbon content and may be assumed to be substantially the properties of the pure ferrite.

Austenite, the high temperature structure of carbon steel, is stable only above 1,500-1,600 deg. F. and reverts to ferrite on cooling slowly below 1,300 deg. F. This structure is stable down to room temperature when a minimum of 8 percent nickel is present in the steel.

Martensite results from rapid cooling of carbon steel from its completely austenitic state (above 1,600 deg. F. for low carbon steels) down to room temperature. Carbon does not have time to separate out as iron carbide; instead it remains in solution in the ferrite, which becomes super-saturated with carbon. The extra dissolved carbon in martensite results in a very hard structure.

Addition of certain alloying elements, particularly chromium and increased carbon content, causes martensite to form at relatively slow rates of cooling. Thus, hot forming operations and welding of chromium alloy steels and carbon steels with more than 0.35 percent carbon result in martensitic structures whose hardness and brittleness require special fabrication techniques—preheat and post-heat treatments become mandatory. Molybdenum has the same effect as

Table I—Composition of Various AISI Type Steels*

AISI Type	Composition, Percent							
	C	Mn (max.)	Si (max.)	P (max.)	S (max.)	Cr	Ni	Other
501	Over 0.10	1.00	1.00	0.04	0.03	4.00-6.00	—	
502	0.10 max.	1.00	1.00	0.04	0.03	4.00-6.00	—	
405	0.08 max.	1.00	0.75	0.04	0.04	11.50-13.50	0.50 max.	0.10-0.30 Al
410	0.15 max.	1.00	1.00	0.04	0.04	11.50-13.50	—	
430	0.12 max.	1.00	1.00	0.04	0.04	14.00-18.00	0.60 max.	
446	0.35 max.	1.00	1.00	0.04	0.04	23.00-27.00	—	
304	0.08 max.	2.00	1.00	0.04	0.04	18.00-20.00	8.00-11.60	
321	0.08 max.	2.00	1.00	0.04	0.04	17.00-19.00	8.00-11.00	5×C min. Ti
347	0.08 max.	2.00	1.00	0.04	0.04	17.00-19.00	9.00-12.00	8×C min. Cb
316	0.08 max.	2.00	1.00	0.04	0.04	16.00-18.00	10.00-14.00	1.75-2.50 Mo
309	0.20 max.	2.00	1.50	0.35	0.30	22.00-24.00	12.00-15.00	
310	0.25 max.	2.00	2.00	0.35	0.30	24.00-26.00	19.00-22.00	

* "Report on The Strength of Wrought Steels at Elevated Temperatures," issued by the ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals, Special Technical Publication No. 100.

chromium although to a lesser extent. The desirable high temperature properties of chromium-molybdenum steels are partially offset by the fabrication difficulties encountered when using these steels. When nickel is used to give an austenitic structure stable at room temperature, no transformation occurs on cooling.

Low carbon plate steels in the as-rolled condition have a ferritic structure with the carbon present as iron carbide plates. Exposure to high temperatures causes the iron carbide particles to spheroidize. Longer exposure to high temperatures will often cause the iron carbide to break down into iron and graphite because Fe_3C is not a stable compound.

Alloy steels having up to 12 percent chromium tend to have martensitic structures and are air and weld hardening. The presence of ½ to 1 percent molybdenum in the chromium steels does not alter this characteristic.

With chromium contents greater than 12 percent, the structure is ferritic and the steel is not hardenable (in low carbon steels).

Austenitic alloy steels have a minimum of 8 percent nickel for stability and 18 percent chromium to insure adequate corrosion resistance. Austenite is recognized to be more creep-resistant at elevated temperatures than ferrite. In the upper range of temperatures (above 1,300 deg. F.) it is necessary to use austenitic stainless steels or one of the "super-alloys" developed for jet turbines for stressed parts. Straight chromium stainless steels with 17 percent or more chromium may be used for unstressed parts up to 1,800 deg. F. and have been successfully substituted for 18-8 stainless steels for this service.

Table II—Recommended Minimum Percentages of Alloying Elements in Steel to Resist Attack of Specified Atmospheres.

	800 to 900° F.	900 to 1,000° F.	1,000 to 1,100° F.	1,100 to 1,200° F.	1,200 to 1,300° F.	1,300 to 1,400° F.	1,400 to 1,500° F.	1,500 to 1,600° F.	1,600 to 1,700° F.
Oxidizing (Scaling)	None	½% Cr	2% Cr	5% Cr or 3% Cr plus 1% Si	7% Cr or 5% Cr plus 1.5% Si	9% Cr or 5% Cr plus 1.5% Si	17% Cr	27% Cr or 18% Cr plus 8% Ni	27% Cr or 25% Cr plus 12% Ni
Corrosive (H_2S in hydrocarbon gases)	None in still atmos., 5% Cr with erosion		12% Cr	12% Cr	18% Cr plus 8% Ni	—	—	—	—
Carburizing (From decomposition of hydrocarbons)	Carburization not serious below 1,300° F.					18% Cr plus 8% Ni	25% Cr plus 20% Ni*	25% Cr plus 20% Ni*	Inconel
Hydrogen (Pressures below 200 psi.)	None	0.5% Mo	1% Cr plus 0.5% Mo	2% Cr plus 0.5% Mo	5% Cr plus 0.5% Mo	18% Cr plus 8% Ni above 1,300° F.			
(Pressures between 200 & 1,200 psi.)	1% Cr plus 0.5% Mo		2% Cr plus 0.5% Mo	6% Cr plus 0.5% Mo	18% Cr plus 8% Ni above 1,300° F.				
(Pressures above 1,200 psi.)	3% Cr plus 0.5% Mo		5% Cr plus 0.5% Mo	18% Cr plus 8% Ni above 1,100° F.					
Steam	None	1% Cr	3% Cr	5% Cr or 3% Cr plus 1% Si	9% Cr or 5% Cr plus 1.5% Si	17% Cr	27% Cr or 18% Cr plus 8% Ni	27% Cr or 25% Cr plus 12% Ni	27% Cr or 25% Cr plus 20% Ni

* Silicon addition improves resistance to carburization here.

INFLUENCE OF ALLOYING ELEMENTS

Molybdenum

Molybdenum is the most effective of the common alloying materials in increasing high-temperature strength of steels. One-half percent molybdenum approximately doubles the creep strength of low carbon steel at 1,000 deg. F. It considerably improves the strength of low-chromium steels—the effect diminishing with increased molybdenum content as well as increased chromium content. Over 1 percent molybdenum is not economical and 1 percent molybdenum in 2¼ percent chromium is optimum.

Molybdenum increases air hardening characteristics of steels as compared to low-carbon steels. Addition of ½ percent molybdenum represents a compromise between obtaining high creep strength but limiting air hardening tendencies.

Molybdenum diminishes "temper brittlement" characteristics of chromium steels.

It has a tendency to promote graphitization above 850 deg. F. This tendency is increased by greater amounts of aluminum used in "killing" the carbon-molybdenum steels.

Chromium

Chromium improves scaling resistance at high temperatures. Where resistance to oxidation is the sole criterion, increments of chromium above 4-6 percent are not warranted at temperatures below 1,200 deg. F. 4-6 percent chromium steel's oxidation resistance decreases significantly above 1,200 deg. F. This can be counteracted up to temperatures of approximately 1,400 deg. F. by the addition of 1.5 percent silicon or 1.0 percent silicon and 0.5 per cent aluminum. At temperatures in the range of 1,500 deg. F. and above, however, chromium contents of 18 percent and higher will be called for.

Chromium improves corrosion resistance at high temperatures. In the case of corrosive petroleum stocks, corrosion resistance is proportional to the chromium content.

Alloys up to 12 percent chromium air harden and require preheating and stress-relieving to prevent cracking from welding or any hot forming operation. Aluminum in 11-13 chromium (Type 405) reduces air hardening tendencies.

In chromium-molybdenum steels the addition of chromium does not increase creep strength at all, in fact, additions above 2¼ percent decrease it.

Chromium induces "temper brittleness," a lowering in impact strength in steels that have been heated in the range of 850 to 1,100 deg. F. and slowly cooled. This increases with chromium content in straight chromium steels except for the 11.5 to 14 percent and higher chromium steels which are not subject to temper embrittlement. Hence, low chromium steels used in high temperature service have ½ to 1 percent molybdenum added.

Chromium lessens the tendency of carbon and carbon-molybdenum steels to graphitize.

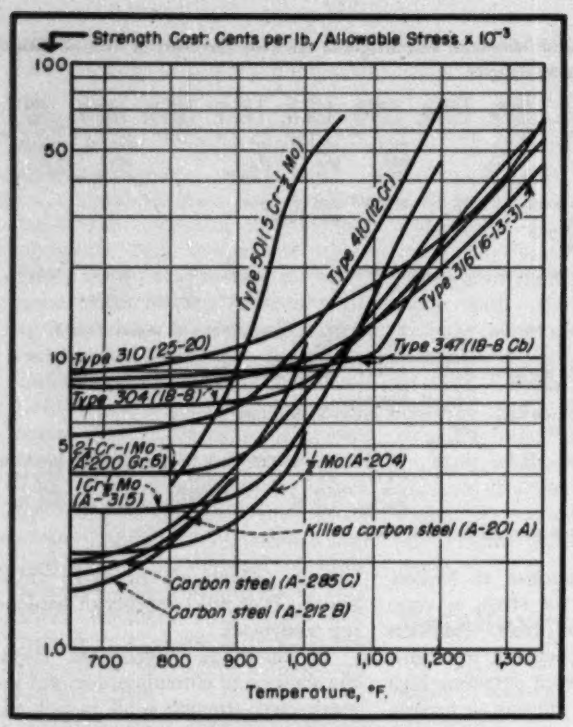
Straight chromium steels with 17 percent or more chromium are subject to grain coarsening when exposed to high temperatures for long periods. Metal becomes brittle when cold.

Nickel

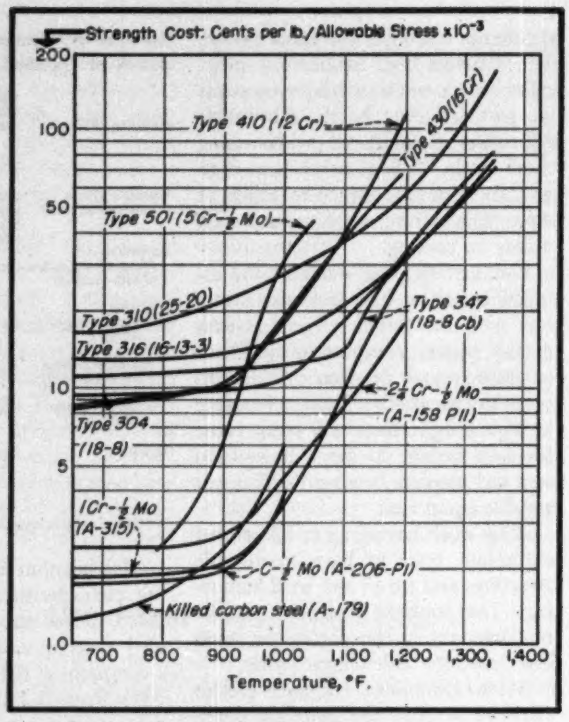
Nickel renders steels austenitic in structure when it is present in amounts of 8 percent and above. This gives a non-hardening steel with superior strength, toughness, corrosion resistance and oxidation resistance at high temperatures.

In steels with less than 8 percent nickel which are not austenitic, nickel does not improve the high temperature creep strength.

In austenitic steels, nickel causes embrittled structure when in contact



Strength cost: fabricated steel plate, ¾ in. thick.



Strength cost: exchanger tubes, 1 in., 14 gage.

with sulphur compounds at high temperatures and is thus undesirable.

Silicon

Silicon is used to "kill" carbon steel by de-oxidizing the melt. It gives a more uniform structure.

ASME UPV 1950 code allows 50 percent greater allowable stress for "killed" steel for than for "rimmed" carbon steels at 1,000 deg. F. The 1951 addenda to this code terminates the allowable stresses for rimmed steels at 900 deg. F., giving the same allowable stress at this temperature as for "killed" steels. Silicon as an alloying element does not necessarily improve the creep strength, but the code presently acknowledges the superior quality of the "killed" steels and better oxidation resistance.

Less than 3 percent silicon does not help corrosion resistance but does improve the oxidation resistance of low-carbon and low-chromium steels.

Over 2 percent silicon renders steels brittle and unsuitable for welding and forming operations.

Silicon reduces slightly the creep strength of low-chromium steels.

Aluminum

Aluminum is added for manufacturers' convenience to more thoroughly deoxidize steel. It affords good control of grain size as it tends to give a fine grain size.

It reduces creep strength of low-carbon steels.

It increases graphitization of low-carbon and carbon-moly steels.

Aluminum is used in 12 percent chromium steel, Type 405, to give a non-weld hardening property.

Titanium and Columbium

In austenitic 18-8 steels titanium and columbium prevent or retard chromium carbide intergranular precipitation, which in corrosive mediums will result in intergranular corrosion. Their effect is due to the formation of their own stable carbides. In carburizing atmospheres their effect is soon nullified.

They reduce air hardening tendencies of martensitic chromium steels.

Titanium vaporizes at melting point of iron and is partially lost. Thus in welding Types 321 and 347, a Type 347 rod must be used or an inert arc welding technique where Type 321 electrodes are used.

Carbon

Increase in percent carbon does not improve creep strength since carbides are spheroidized.

Higher carbon content is useful in medium temperature applications where tensile strength is enhanced.

Increased carbon increases air hardening characteristics of carbon steel. (In high temperature applications, carbon content should always be kept to a minimum for easy weldability).

As a result of heating for prolonged periods at temperatures above 900 deg. F., carbon in plain carbon steel separates by the decomposition of iron carbide to form graphite at the grain boundaries. Aluminum accelerates this process, chromium inhibits it.

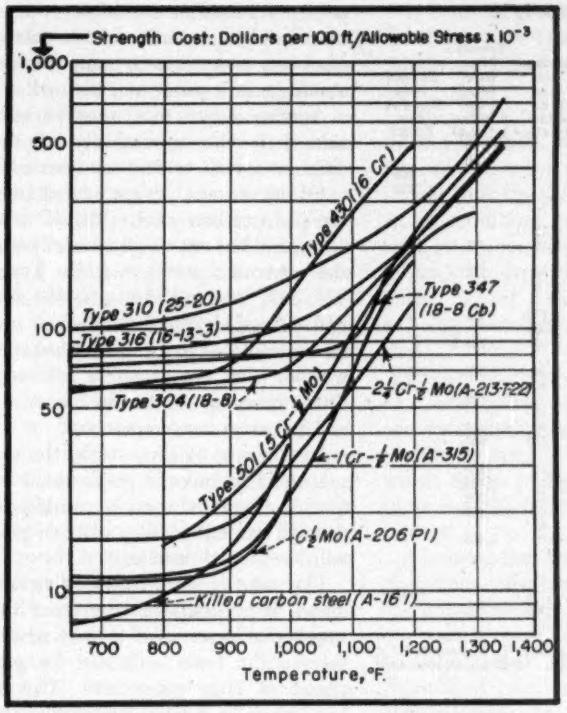
Carbon contents below 0.35 percent and plate thicknesses under 1¼ in. in plain carbon steels may be welded without necessity for preheating and stress-relieving.

HIGH TEMPERATURE ATMOSPHERES

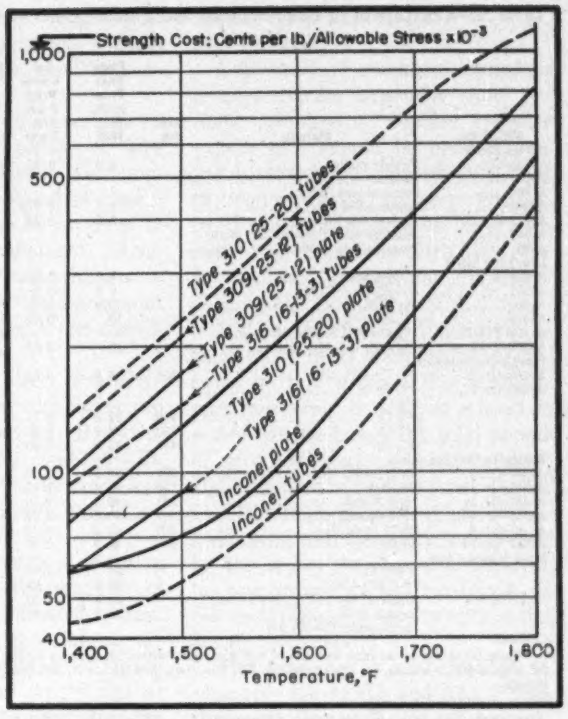
Oxidizing

Scaling of steels due to oxidation is an every-day problem. Any metal in contact with air at high temperatures is subjected to high temperature oxidizing conditions. Since fuel is ordinarily burned with an excess of air, all materials in contact with the flue gas in a combustion chamber such as tubes, tube supports, etc. are under high temperature oxidizing conditions.

As the temperature increases, so does the rate of oxidation. For example, the relative increase in weight loss in a



Strength cost: pipe (furnace tubes), 4 in. O.D., ¼ in. wall.



Strength cost: Same plate and exchanger tubes above 1,400 F.

2 percent chromium steel going from 1,100 to 1,300 deg. F. is over 25-fold.

Chromium is the alloying constituent most effective in decreasing oxidation. Silicon also has beneficial effects. A 4-6 percent chromium steel with 1.5 percent silicon will have high resistance to oxidation up to 1,500 deg. F., while a 4-6 percent chromium steel will only be good up to 1,200 deg. F. 18-8 austenitic steels have adequate oxidation resistance up to 1,600 deg. F. while 25-12 and 25-20 austenitic steels have high resistance up to 2,000 deg. F.

Corrosive

Corrosive atmospheres, in general, can be defined as those which will weaken the steel structurally due to excessive weight loss induced by continued chemical reaction.

Of the many corrosive atmospheres found in refinery work, sulphur as H_2S is most prevalent. Here chromium is the most effective means of reducing corrosion in steels at high temperature conditions. The type of steel needed for a particular service can only be determined by experience.

Carburizing

A carburizing atmosphere is one that induces the adsorption of carbon by iron. This is ordinarily serious only at temperatures above 1,300 deg. F. and increases rapidly with temperature. At 1,300 deg. F. and above, gases and vapors that tend to break down to carbon (such as petroleum cuts, butane, propane, ethane, methane, city gas) will cause carburization. Unsaturated gases are more severely carburizing than saturated.

Dilution of carburizing gases with steam restricts carburization.

Carburized steels lose their ductility and become brittle. They tend to fail under shock at lower temperatures, or they fail by cracking induced in alternate heating and cooling cycles by the differences in expansion.

Increased nickel content of steel decreases the tendency to carburize with 25-20 being more resistant than 18-8. Inconel, an alloy of 70 percent nickel, 17 percent chromium and iron is the most carburization-resistant commercially available tube material. Silicon also decreases carburization.

Hydrogen

Hydrogen at high temperatures and pressures decreases the tensile strength of carbon steels significantly. The mode of attack involves decarburization with resulting brittleness and eventually fine-grain cracking of the steel.

(*Continued on page 328*)

"Strength Cost" Is a Criterion

Availability of carbon and alloy steel is dependent on political and economic factors. At the present time, the critical international situation has created a shortage of molybdenum, nickel, and columbium.

It has been necessary to resort more to the straight chromium alloy steels as a matter of economics and expediency. The most popular grade is the 11-13 percent chromium steel, either as Type 410 or 405.

Materials most difficult to get are the stabilized stainless grades, Types 321 and 347, and the molybdenum stainless grade, Type 316. Type 501, 5 percent chromium-½ percent molybdenum, is in increasingly short supply. Ordinarily this material would be readily available as is the unstabilized stainless steel, Type 304. The chromium-molybdenum steels with less than 12 percent chromium were primarily developed as tube materials and

Table III—Comparison of Basic Material and Product Costs as of 3/1/52*

ASTM No.	Material	AISI No.	Plate Base Price ¢/Lb. Fob. Mill	Est. Vessel Price $/Lb. Fob. Shop[1]	Exchanger Tubes Base Price ¢/Lb. 1"×14 Ga.[2]	Furnace Tubes Base Price $/100' 4" O.D.–¼" Wall[3]	Estimate Price Shop Fab. Pipe $/100'[4]
Carbon Steels							
A-285-C	Firebox quality		4.6	0.25			
A-53	Seamless pipe						500
A-106	Seamless pipe (killed)						510
A-201-A	Silicon-killed FB		5.2	0.275			
A-212-B	High-tensile FB		5.2	0.28			
A-161	Seamless tube (0.10-.20 Car. Max.)				0.15		
A-83	Seamless tube (0.06-.18 Car. Max.)				0.15	91.	
Low Alloy Steels							
A-204-A	C-½% Mo		8.0	0.35	0.34	152.	
A-301	C-½% Cr-½% Mo		8.3	0.38	0.28	169.5	
A-203	3½% Ni		8.9	0.40			
A-315	1% Cr-½% Mo		10.	0.45	0.275	173.	
A-155-P11	1¼% Cr-½% Mo (tube)				0.305		
A-213-T-22	2¼% Cr-1% Mo (tube)		20.	0.90	0.86	242.0	
Ferritic Stainless Steels							
A-200-Gr. 8	5% Cr-½% Mo	501	24.8	0.65	0.44	270.	2,000
A-200-Gr. 7	7% Cr				0.50		3,800
	9% Cr					352.	
	13% Cr	410	32.5	0.75	1.15		
	16% Cr	430	33.0	0.80	1.30	841.	
	28% Cr	446	42.0	1.00	1.375	900.	
Austenitic Stainless Steels							
A-167-Gr. 3	18% Cr-8% Ni	304	40.5	1.00	1.37	886.	
A-167-Gr. 11e	16-13-3	316	57.0	1.35	2.18	1,428.	
A-167-Gr. 5a	18-8 Ti stab.	321	46.0	1.20	1.66	1,020.	
A-167-Gr. 6b	18-8 Cb stab.	347	50.5	1.25	1.67	1,085.	
A-167-Gr. 5	25-12 (welded)	309	52.5	1.30	1.60		
A-167-Gr. 10	25-20	310	65.5	1.50	2.70	1,690.	
Misc. Nickel Alloys							
	9½% Ni		20.	0.75			
	Ni ("A") AW		82.0	1.85	1.40		
	Monel A. W		66.5	1.80	1.175		4,200
	Inconel A. W		88.5	2.00	1.525		
	Cupro-nickel (70-30) AW				0.72		

* These prices will be the same for steels of equivalent composition but different ASTM numbers. (1) 5' diam. × 25' × ⅝" with 1-MH, 6 nozzles, no internals. (2) HF, Min. wall, Base Q&L. (3) HF, Base Q&L. (4) 6" Sch. 40, Standard fittings.

(except for the 5 percent chromium grade) are generally unavailable as plate unless a large order can be placed at the mill.

With this article are plots and tables presenting the economics of the use of various steels, carbon and alloyed, at high temperatures. The criterion of selection is "strength cost" defined as the cost per pound or hundred feet divided by the allowable stress in thousands of pounds per sq. in.

Plate, exchanger tubes, and pipe (furnace tubes) are covered. For plate the cost is as-fabricated, a representative vessel being used. For tubes and pipe the cost is base price at mill. The allowable stress for the most part is per the 1951 addenda to the 1950 UPV ASME Code and where it does not apply, 1 percent creep in 100,000 hr. is used. The range from 1,400 to 1,800 deg. F. is covered separately. The representative vessel for the plate is the same as in note (1) to Table III above.

With the plots as a guide for any temperature, the most economical steel or steels can be selected. The plots do not take into account the desirability of the various metals from any criterion other than their strength.

Corrosion or other high temperature effects may preclude the use of a metal where economically, on a strength-cost basis, it is most desirable. Inconel, which above 1,400 deg. F. is outstanding economically, is a case in point. Its resistance to high-temperature sulphur corrosion is in many cases very poor: thus in many sulphur atmospheres it would not be used.

Another factor that must be considered is the applicability of the different metals to field fabrication.

Of the various ones considered, only the plain carbon steels ("killed" and "rimmed" but not "high tensile") and the austenitic stainless steels Types 321, 347, 309, and 310—also 304 and 316 (if carbide precipitation will not be harmful)—can be field fabricated without the use of stress relieving. Stress relieving in the field is costly and in many cases impractical.

In the case of alloy steels, the significant differences in prices based on quantities ordered must be considered. A small amount of alloy plate or pipe will have a high unit cost.

On some projects requiring various alloys, it is desirable to restrict the number of types used to take advantage of the lower unit cost for purchases of large quantities. This is not generally a consideration in the case of carbon steels as the quantities purchased are usually quite large.

Design for Creep and Rupture

Criteria for mechanical design of equipment operating at elevated temperatures are based on two phenomena which occur in metals at these temperatures, but whose effects are negligible at ordinary temperatures.

These phenomena are creep and rupture of the metal when a constant load resulting in a stress below the short time yield or ultimate strength of the material is applied over a period of time. The design, therefore, is against excessive deformation or even rupture at relatively low stress levels.

To approach this problem in a systematic way, it is necessary to have a knowledge of the conditions which produce stress and to make realistic assumptions for the design conditions and allowable stresses.

CONDITIONS PRODUCING STRESS

Two general types of stresses are encountered in equipment at elevated temperatures, self-relieving and non-relieving.

Self-relieving stresses are developed as a result of physical restraint of thermal expansion within the elastic limit of the metal. The tendency for creep to occur at elevated temperatures in time reduces the magnitude of the thermal stresses so that a permanent set is taken, which tends to minimize stresses in the hot condition.

Non-relieving stresses are developed by constant loads imposed on metal. Equipment under pressure or carrying a direct load will have such stresses. This equipment is subject to time-creep and time-rupture phenomena when in high temperature service.

In designing equipment against failure due to restraint of thermal expansion, the only situation which must be considered is the initial heating-up period when stresses are greatest.

If failure does not occur at this time, it will not occur as long as the conditions are not changed. Creep of the metal under these conditions does not take place in the ordinary sense. Stress relieving is accompanied by no further change in dimensions and for this reason, rupture of the metal cannot take place in service.

But if the restraint of thermal expansion can cause failure during the first heating-up period, the initially high stresses must be reduced.

The technique of cold-springing is widely used in piping applications and accomplishes the purpose previously stated. Metals are stronger at ordinary temperatures than at elevated temperatures, and it is possible to transfer the maximum stress to a lower temperature at which failure will not occur. A deflection is imposed in the cold state such that on heating-up, the stress will pass through zero at some intermediate temperature. The effect is to produce a stress at the high temperature which is considerably less than the original anticipated stress.

Approximately the same effect results when creep phenomenon relieves thermal stresses, with a relatively stress-free condition developing when hot and the maximum stress when cold. The time for stress relief due to creep depends on the temperature and the creep characteristics of the material.

Design of high-temperature equipment against failure from non-relieving type stresses follows more or less classical lines except that time-creep and time-rupture must be considered.

The criteria for such design are the maximum allowable creep or deformation in the equipment during the period of service and the preclusion of rupture during its expected service life. Thus, it is necessary to specify the service life and maximum permissible distortion in addition to the design conditions before the design can be properly executed.

ALLOWABLE STRESSES

Codes which govern the methods of designing equipment are quite specific in stating the allowable stresses which may be used. However, the specification of design conditions is left largely to the engineer's imagination.

At medium temperatures where allowable stresses of steels fall off at a relatively slow rate with increasing temperature (if at all) any criticisms of the methods for selecting design conditions may be ignored.

But when the service temperature is over 800 deg. F., the importance of proper choice of design conditions becomes extremely significant. The allowable stresses of steels at high temperatures proposed for the ASME Code indicates a rapid rate of falling off of creep strength at high temperature range, a systematic approach to specifying valid design conditions is definitely warranted.

It is hardly possible to design equipment for high temperatures without qualifying the design conditions to some extent.

Since time is an important factor in the behavior of metals at high temperatures, the design conditions should indicate the period of time a set of conditions may be expected to exist in a piece of equipment. In addition, the type of deformation or failure against which the equipment is being protected should be considered.

High temperature stress data of alloys indicate separately the time-creep and time-rupture behavior. It is convenient to specify the conditions for which design is limited by creep and those for which design is limited by rupture.

Assuming that the normal operating conditions exist for the majority of operational time, the plastic flow from creep may result in considerable deformation over a period of years. Equipment tolerances should also be kept in mind. The service life of the equipment plus the maximum permissible deformation in any of the parts give the allowable creep rate and correspondingly the allowable stress.

In turbine blade design, which until recent years has dominated the high temperature alloy field, close tolerances during long operational runs required that a very low rate of creep (1 percent in 100,000 hr.) be specified. This should hardly be necessary in large process equipment for petroleum refineries and chemical plants where the original manufacturer's tolerances are not very close. A creep rate of 1 percent in 10,000 hr. or some value intermediate between this and the long term creep rate might be economically justified.

Where a piece of equipment occasionally operates for short periods under slightly more severe conditions (as is sometimes the case during startup or shutdown), stresses producing higher creep rates can be tolerated as long as the service time of such stresses are considerably less than the time for rupture.

Assuming that maximum operation was limited to 100 hr. per year or a total of 1,000 hr. for 10 yr. of operation, it would probably be safe to design against long-term rupture (10,000 hr.). If longer periods of maximum operation are expected, rupture stresses for periods up to 100,000 hr. may be used.

Conversely, if maximum operation is expected for extremely short periods, short-term rupture stresses (1,000 hr.) should be used. Creep and rupture stress data when plotted on log-log graphs as creep rate vs. stress and rupture time vs. stress give straight line functions. Such plots may be used for interpolating and extrapolating the available data.

A third set of design conditions is based on on upset or emergency operation. If it is assumed that such an operation would be relieved as soon as action can be taken, the total period of very high stresses would be short and a short-term rupture stress (1,000 hr.) for design purposes is acceptable. In keeping with the safety factors used by the codes, the allowable stress in no case should exceed one-fourth of the short-time ultimate strength at the design temperature.

The foregoing is not intended to supercede the ASME and ASA Piping Codes which use the long-term creep rate, 1 percent in 100,000 hr., for establishing the allowable stresses. For pressure parts of equipment covered by these codes, these allowable stresses should be used for the normal operational conditions.

Special design conditions involving short periods of higher stress should be examined separately using as much of the creep, rupture and strength data as are available for the particular alloy involved. Where codes do not specify allowable stresses, however (such as in the case of cat cracker regenerator grids), designers should specify a design stress based on either creep-rate or creep to rupture, where the choice of either one as well as the time factor will rest with him and will depend on the particular situation.

ACKNOWLEDGMENT

The authors wish to thank the management of the Foster Wheeler Corp. for permission to publish this article. Acknowledgment is made of the help rendered by Messrs. N. Block, metallurgist and E. F. Brummersted, chief estimator of the Foster Wheeler Corp., G. V. Smith of the U. S. Steel Co. research laboratory, and various technical personnel of the International Nickel Co.

—End

The Plant Notebook

Edited by Theodore R. Olive

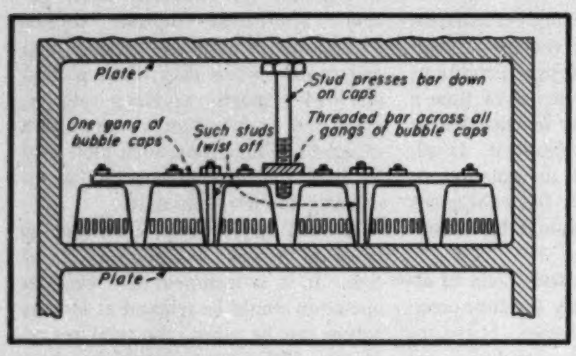


Plate
Stud presses bar down on caps
One gang of bubble caps
Such studs twist off
Threaded bar across all gangs of bubble caps
Plate

How to Rig Bubble Caps for Easier Replacement

ROLAND P. LOEWEN, *Chem. Engineer, Chattanooga, Tenn.*

★ **November (II) Contest Winner**

Certain materials we were distilling were filling the bubble cap slots and downcomers with a hard, carbonaceous mess. There were frequent plugs-ups which we were clearing partially by scraping the caps that could be reached through the handholes.

Finally, further operations became impossible and heavy orders for the product did not allow a lengthy shutdown.

Originally the bubble caps had been fastened together in gangs by a bar across the top of each row. Each gang or row was then fastened down on the plate by a stud through the bar. Nine out of ten of these studs twisted off when the caps were removed for a good cleaning of the column. Drilling out the broken studs and retapping the plate was almost an impossibility because of the small handholes.

After some discussion we told the maintenance crew to remove all the caps as rapidly as possible by cutting and chiseling all of the studs. They cleaned the caps, plates and downcomers thoroughly and set the caps back in place.

While the cleaning was going on they made a hold-down jack for each one of the plates. This consisted of a stout bar long enough to reach across all the rows of bubble caps. Each one was drilled and tapped in the center, and a stud with plenty of threads was installed in each. This stud was long enough to reach the bottom of the plate above, as the sketch shows.

Finally, we slipped these jacks in place across each plateful of caps and tightened the stud to press the caps in place. It is estimated that down time was less than 10 percent of that required for replacing original construction.

Operation by the new system has been successful for over two years, and cleanup work during that time has been both simpler and cheaper.

Rapid Method for Moisture Content Estimation in Plant Products

H. F. REICHARD, *Chemical Engineer, Vitro Corp. of America, Jersey City, N. J.*

A color change caused by the presence of water has been adapted to give a simple, rapid method for estimation of moisture content in nearly dry materials. The method may be used for rapid, on-the-spot control of industrial drying operations, or in other applications where speed and simplicity are of more interest than great precision.

The principle depends upon the change of deep blue anhydrous cobaltous chloride to a pale pink hydrate upon addition of moisture. The test solution is made by dissolving a very small amount of anhydrous cobaltous chloride (air dried at 100 deg. C.) in water-free ethanol to form a blue solution.

To use the test solution, some of it is placed in a colorimetric comparison tube and a measured amount of sample is added. After shaking the sample a few moments in the test solution, its color is compared with previously analyzed standards to allow the moisture content to be estimated.

A simple way to make up a comparator of this type is to use a wooden stand similar to a three-tube test-tube stand in which three transparent tubes with tight-fitting transparent plastic covers are supported so that the viewer can look down through the tubes to a white glass plate a short distance below which serves as a viewing background. A calibrated measuring cup can be used to measure in the desired amount of material. The sample can be placed in the middle position and standards inserted either side of it for easy comparison.

The method is applicable for any materials which will release their moisture in anhydrous ethanol and whose interfering color, if any, is either faint or will not dis-

---

★**December Contest Prize Winner**

"Tricks for Introducing Reactants Into Autoclaves Under Operating Pressure."

A prize of $50 in cash will be awarded to A. W. Billitzer, research department, Beckers Pty. Ltd., Dudley Park, South Australia. Mr. Billitzer's article will appear in our March issue.

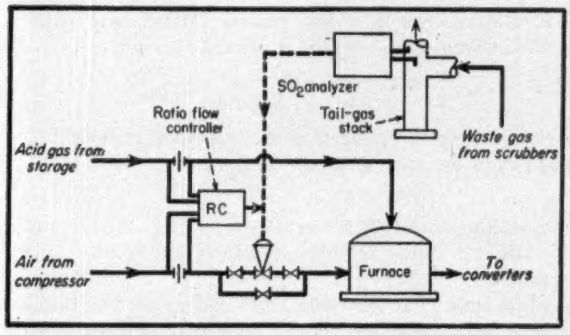
$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering*, will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook. Each month's winner will be announced the second following month and published the third following month.

$100 ANNUAL PRIZE—At the end of each year the monthly winners will be rejudged to determine the year's best Plant Notebook article, which will then be awarded an additional $100 prize.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Articles which are acceptable but are not winners will be published at regular space rates ($10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.

perse in solution. In preliminary tests of the method, anhydrous samples of both sodium sulphate and dried paper could be readily differentiated colorimetrically from corresponding samples of the same materials containing about 5 percent added moisture. Undoubtedly, long experience would permit an operator to detect smaller differences in moisture than the foregoing.



Sulphur Recovery Improved by Tail-Gas Analyzer

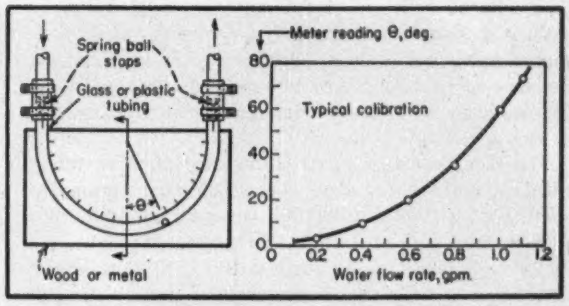
ANTHONY P. MASSA, *Chemical Engineer, Bronx 61, N. Y.*

In a typical sulphur recovery plant running on acid gas recovered from petroleum refining and desulphurizing operations, a ratio controller is used to control the quantity of air admitted to the furnace. There part of the hydrogen sulphide is burned under controlled conditions to sulphur and sulphur dioxide. Since the ratio of sulphur dioxide formed, to unburned hydrogen sulphide remaining in the furnace gases, must be maintained at 1 to 2, the ratio controller is very useful in controlling the composition of the outlet furnace gases by introducing the exact quantity of air to the furnace. This instrument is necessary since the quantity of acidic gas going to the furnace is subject to frequent variations.

At the same time, however, the acidic gas composition may also vary. In this case, the ratio controller can no longer accurately control the operation of the furnace since it cannot detect the variation of the hydrogen sulphide content of the gas. In this situation, the use of a sulphur dioxide analyzer eliminates the difficulty. Sulphur dioxide analyzers of the infrared absorbing type are very sensitive and can be furnished calibrated for the continuous measurement of sulphur dioxide in the range of 0.005 to 1 percent by volume.

This instrument is mounted on the tail gas stack of the sulphur recovery plant and thus can continuously record the sulphur dioxide content of the gases coming from the wash towers and condensers. Since the presence of sulphur dioxide in the stack gases indicates an excess of oxygen (or air) admitted to the furnace, the sulphur dioxide recorder is very important for controlling sulphur losses from the process.

At the same time, the sulphur dioxide analyzer can be connected directly to the ratio controller so that either the acidic gas stream or the air to the furnace can be regulated to give a minimum quantity of sulphur dioxide in the stack gases. By this method, sulphur loss and air pollution can be cut to a minimum.



Versatile Flow Meter Measures Flow in Two Directions

H. L. SHULMAN, F. M. STIEGER and A. R. LEIST, *Department of Chemical Engineering, Clarkson College of Technology, Potsdam, N. Y.*

Many times it is necessary to measure the rate of flow of fluids entering and leaving a unit through the same line. To accomplish this with the simple flow meters available commercially it is usually necessary to use two meters or to provide extra valves and piping, if one meter is used, because these meters indicate flow in only one direction.

This article describes a simple but versatile flow meter designed to measure the flow of liquids to a pilot plant column, and the rate of backwash from the column, both through the same line. This it accomplishes without the use of additional valves or piping. The meter consists of a length of flexible tubing inserted in a semicircular groove cut in a sheet of metal or plywood. The indicating element of the meter is a ball placed in the tube and retained by spring ball stops when the capacity of the meter is exceeded. A paper protractor, of the same diameter as the semicircle, may be mounted on the meter to provide a scale reading in degrees from zero at the rest point of the ball, to 90 deg. where the tubing becomes vertical.

The principle of the meter is the same as that of Gradishar's meter (Gradishar, F. J., *Chem. Eng.*, **57**, pg. 122, Oct. 1950) which consisted of a quarter circle of tubing. However, the present meter is simpler even for measuring flow in one direction because a semicircle provides a simple leveling device in that the ball comes to the zero position on the scale when the meter is level and the flow is zero. This feature make it easy to install the meter and eliminates the possibility of errors caused by the accidental tilting of the meter which may go unnoticed in other meters.

There are many variations possible in constructing this simple meter. The tube may be made of glass, Saran, Tygon, polyethylene or any transparent or translucent material which can be given a semicircular shape. If a *translucent* tubing is used it may be advisable to cut the groove completely through the sheet supporting the tube and back the sheet with glass or transparent plastic so that light will come through the tube and make it easier to observe the position of the ball.

Many different types of balls may be used, and are readily available in materials such as nylon, glass, steel, bronze, aluminum and stainless steel. It is also possible to place two different balls in the meter at the same

time. If the balls are of different sizes or densities, or both, it is possible to extend the range of the meter from approximately 6:1 to 20 or 30:1 for flow in one direction. For flow in two directions, two different balls will make it possible to read flows of different orders of magnitude in each direction.

The sketch shows a meter constructed of Saran tubing with clamped rubber hose connections and spring ball stops, with a typical calibration curve for water (using a 0.25-in. steel ball in 0.535-in. I.D. Saran tubing). The meter is suitable for use with gases as well as liquids. The low cost of such meters makes it possible to keep several tubes and balls in stock for various uses.

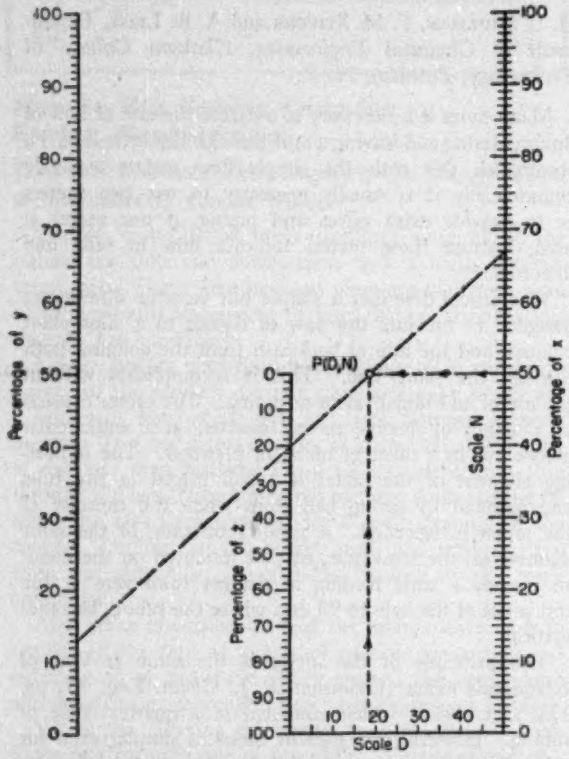


Chart Helps Find Blend Composition For Three Components

JOSEPH T. HOGAN, *Chemical Engineer, New Orleans, La.*

The problem of blending two materials of different moisture content so as to produce a mixture having a desired intermediate moisture content lends itself to simple algebraic solution and several authors have published methods[1, 2, 3] which simplify the numerical computation associated with this task.

The problem, however, of blending three materials of different moisture content so as to produce a mixture having a desired moisture content is not quite as simple. The algebraic equations resulting from a solution of the problem require the use of parameters for arriving at a numerical answer. Because the solution of this problem yields a multiplicity of values, the attached nomograph, constructed by methods described elsewhere,[4] is presented to facilitate numerical computation.

Suppose it is desired to blend three samples of a grain for processing, having moisture contents of 18, 12, and 7 percent, so as to yield a blend of 15 percent moisture content. Letting x, y, and z represent the percentage composition of the blend, we have $x + y + z = 100$ and $18x + 12y + 7z = (x + y + z)15$. If z is eliminated, we have

$$11x + 5y = 800 \quad (1)$$

In the nomograph a line passing through any point P, and cutting scales x and y, is defined as follows:

$$x = N + k\,(50 - D) \quad (2)$$

$$y = N + k\,(-50 - D) \quad (3)$$

Substituting the value of x and y from Equations (2) and (3) in Equation (1), we have

$$16N + k\,(300 - 16D) = 800 \quad (4)$$

Since the equality holds for all values of k, the slope of the line, the values $D = 18.75$ and $N = 50$ satisfy the equation.

Enter scale D at the value 18.75 and proceed vertically upward until the value 50 on scale N is intersected. This intersection defines the point P, which is the pivot point. A straight line passing through P and intersecting scales x, y, and z, gives the respective values in percentage composition of a blend of 15 percent moisture content. The setting shown in the nomograph shows that a blend of 15 percent moisture may be obtained by mixing x, y, and z in the proportion of 67, 13, and 20 percent by weight, respectively. By pivoting about the point P, the values of x, y, and z in percent composition may be obtained for an infinite number of blends, all giving 15 percent moisture.

The nomograph may also be used for determining the composition of blends of desired density when the densities of the components are known.

Use of the nomograph may be summarized as follows:

1. Express the relationship of the components x, y, and z by substituting their moisture contents in the two equations

$$M_1x + M_2y + M_3z = M_4\,(x + y + z)$$
$$x + y + z = 100$$

where M_1, M_2, M_3, and M_4 represent the moisture contents of x, y, z, and the resulting mixture, respectively.

2. Obtain an equation showing the relationship between x and y, by eliminating z in the above equations (Equation 1).

3. Express x and y in terms of Equations (2) and (3).

4. Substitute the expressions for x and y obtained in Step 3 in the equation resulting from Step 2.

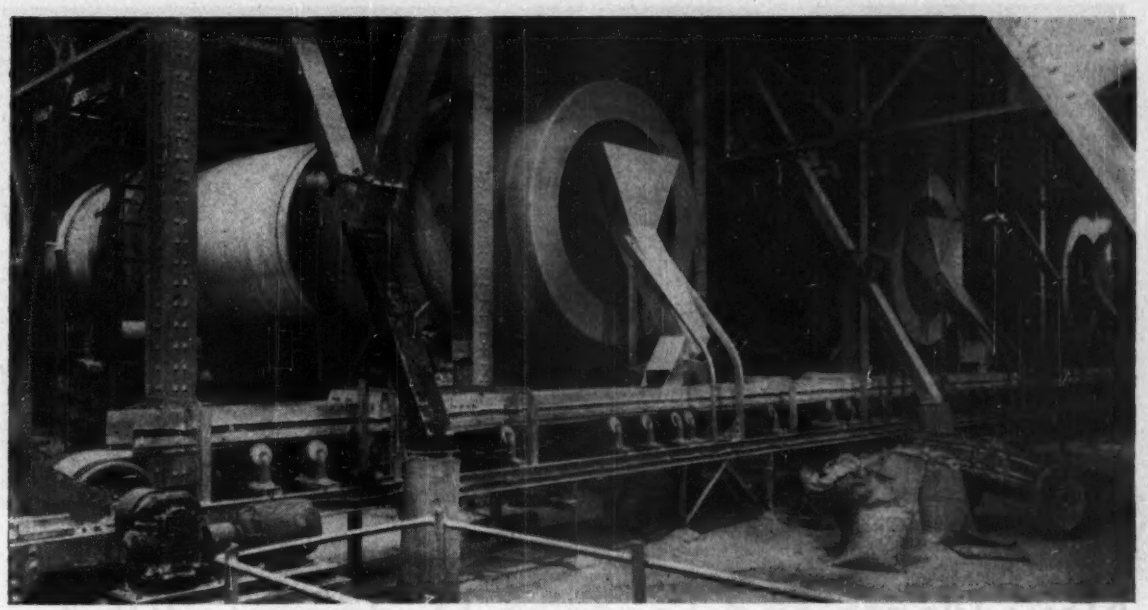
5. In the equation resulting from Step 4, solve for D and N, by inspection.

6. Determine the pivot point P, defined by the intersection of the values of D and N, taken from the scales D and N, respectively.

7. A straight line rotated about the pivot point P intersects the scales x, y, and z at all the values of these components yielding the desired final moisture content.

REFERENCES

1. Crocker, S., "Piping Handbook," 4th Ed., p. 140-41, McGraw-Hill Book Co., Inc., New York (1945).
2. Lyon, Chas. J., *Science*, 79, 60 (Jan. 1934).
3. Monsanto Chemical Catalog, 26th Ed., Monsanto Chemical Co. (1942).
4. Brodetsky, S., "Dictionary of Applied Physics," Vol. 3, p. 638, Macmillan & Co., New York (1923).



PLANTS & PROCESSES

Summarized here for easy reference are the principal developments of the last two years in plant construction in the chemical process industries, and in new processes and new technology announced or commercialized during the same period. The tables include about 1,000 construction, and about 300 technology listings.

CHEMICAL ENGINEERING REPORT - FEBRUARY 1953

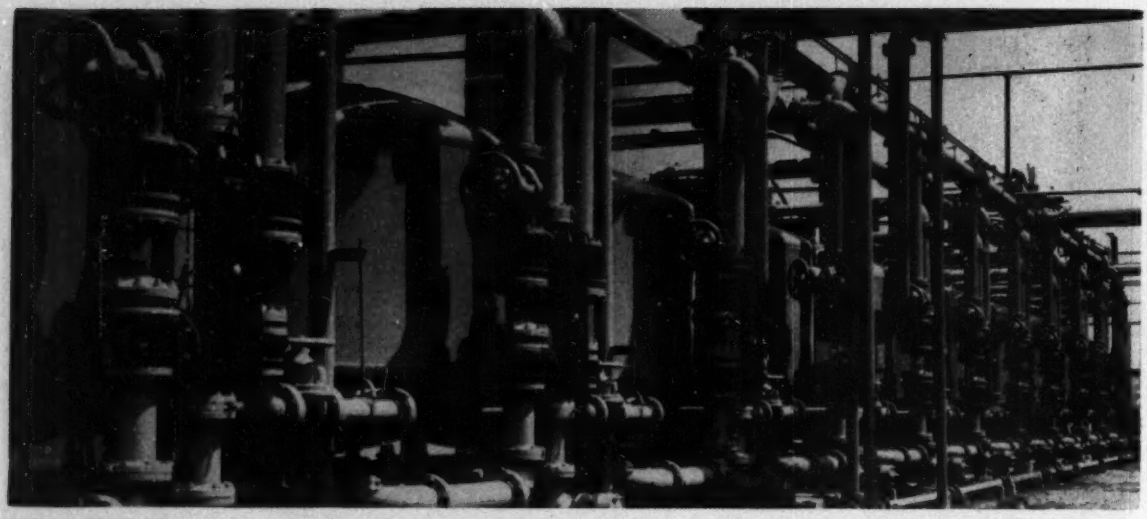
Chemical process industries are on the march! When the present wave of expansion is completed in 1955, capacity for chemicals will have increased by about two and one-half times, compared with 1935-9. The record for other process industries will be similar. Since 1925 chemicals have been expanding at about three times the rate of all industry. Although the accelerated expansion since World War II will have leveled off considerably by 1955, the end is by no means in sight.

In 1951 and again in 1952 we brought you this summary of plant expansion (and in 1952 the process-technology summary as well) as part of our February Annual Review issue. With the one-month advance in our publication date in January 1953, we have separated this tabular section from the main Review, expanded it, and are presenting it here, one month ahead of the main Annual Review. The Annual Review, although it will appear in the March issue this year, will actually reach its readers at the same time as the 1952 February issue.

An important consequence of this separation is that we have been able to expand the tabulation greatly, from a total of 16 pages in 1952, to a total of 32 pages in the present report. The period covered is roughly that from January 1, 1951, to December 15, 1952. Part I of the tabulation—new plants and facilities that were planned, under construction, or completed in 1951-2—contains about 1,000 listings, compared with about 700 last year. Part II—new processes and new technology announced or commercialized during 1951-2—contains about 300 listings, compared with about 200 in the 1952 table.

Concerning planned expansion or new construction for which the status is indicated as "Certificate of necessity issued," readers should realize that inclusion in the tabulation is no assurance of completion. Many projects for which certificates of necessity are issued actually never materialize.

As in 1952, the plants and facilities tabulation will be supplemented in the regular Annual Review issue in March by an article dealing with the construction and expansion trends in the process industries. Process and technology advances will not be treated separately in the Annual Review, but will be discussed individually in a new type of commodity treatment to be introduced in that issue.



CHLORINE: Monsanto Chemical Co., Muscle Shoals, Ala.

New Plants and Facilities Underway 1952

ATOMIC

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Anaconda	Grants, N. M.	.....	Uranium	Under construction. In production by Apr. 1953.
Blockson Chemical	Joliet, Ill.	.....	Uranium	Operating. Recovers uranium from phosphate operations.
Climax Uranium	Grand Junction, Colo.	300,000	Uranium	Certificate of necessity awarded.
Du Pont	Savannah River, S. C.	171,000,000	Tritium, etc.	Dollars indicated represents additional appropriation.
Goodyear Tire & Rubber (Govt. contract)	Portsmouth, Ohio.	1,200,000,000	Uranium 235	Will take 4 years to build. Contract awarded. Gaseous diffusion uranium plant.
International Minerals & Chemical	Mulberry, Fla.	800,000	Uranium	Under construction. To recover uranium from phosphate operations.
National Lead (Govt. contract)	Cincinnati, Ohio	30,000,000	Uranium	Under construction. Will refine uranium ore.
Simpson Coal & Chemical	Caruthersville, Mo.	2,300,000	Phosphoric acid and uranium	Certificate of necessity awarded.
Texas City Chemicals	Texas City, Tex.	7,000,000	Dicalcium phosphate and uranium	Under construction. Cost $7 million. Capacity 56,000 tons of feed-grade product plus 15,000 tons fertilizer-grade. Go on stream after mid-1953. Also to recover uranium.
Union Carbide (Govt. contract)	Oak Ridge, Tenn.	464,000,000	Uranium 235	Contract awarded. Gaseous diffusion plant expansion.
Union Carbide (Govt. contract)	Paducah, Ky.	459,000,000	Uranium 235	Contract awarded.
Union Carbide (U. S. Vanadium)	Uravan, Colo.	.....	Uranium ores	Carnotite processing facilities doubled.
Virginia-Carolina Chemical	Mulberry, Fla.	.....	Uranium	To recover uranium from phosphate operations.
Vitro Chemical	Salt Lake City, Utah.	1,100,000	Uranium concentrates	Expansion being completed. Plans to increase capacity from 165 to 350 tons of ore/day.

CATALYSTS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Bay Chemical	Weeks, La.	1,000,000	Microspherical petroleum cracking catalyst	Underway.
Davison	Baltimore, Md.	210,000	Petroleum catalyst	Certificate of necessity awarded.
Davison	Lake Charles, La.	7,000,000	Cracking catalyst	Under construction. Operating early 1953.
Houdry Process	Paulsboro, N. J.	.....	Catalyst	Unit on stream to produce Houdriforming petroleum catalyst.
Socony-Vacuum	Paulsboro, N. J.	2,500,000	Catalyst	Contract awarded.

CAUSTIC, CHLORINE, SODA ASH

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Allied Chemical & Dye (Solvay)	Baton Rouge, La.	.....	Chlorine	Expanding chlorine capacity.
Allied Chemical & Dye (Solvay)	Hopewell, Va.	2,150,000	Chlorine	Expanding chlorine capacity 28 tons per/day.
Allied Chemical & Dye (Solvay)	Moundsville, W. Va.	15,000,000	Chlorine and caustic	Proposed mercury cell.
Allied Chemical & Dye (Solvay)	Syracuse, N. Y.	20,000,000	Soda ash, chlorine, etc.	Expansion under way.
Central Chemical Corp.	Lebanon, Pa.	397,000	Chlorine, caustic soda	Certificate of necessity awarded.

Caustic, Chlorine, Soda Ash (cont)

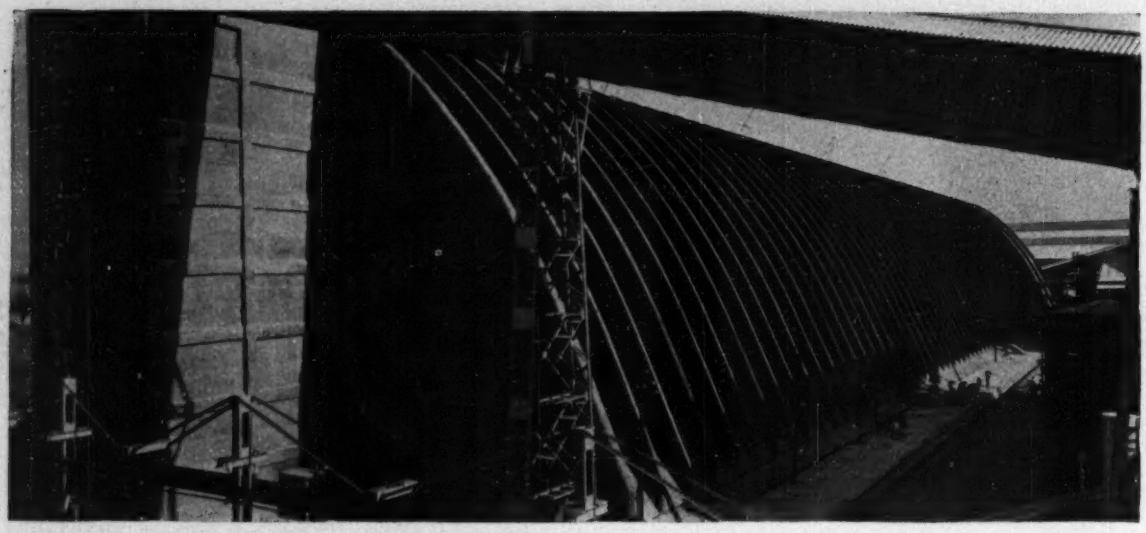
FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Diamond Alkali	Houston, Tex	8,750,000	Chlorine—caustic	Proposed.
Diamond Alkali	Painesville, Ohio	10,000,000	Chlorine—caustic	Contract awarded. Expansion. Will enable company to abandon production of caustic via lime-soda process.
Diamond Alkali	Pine Bluff, Ark	315,000	Chlorine—caustic soda	Certificate of necessity awarded.
Dolomite Reduction Corp	Ada, Okla	12,541,000	Chlorine	Certificate of necessity awarded.
Hercules	Brunswick, Ga	2,000,000	Byproduct chlorine	Installing 1st chlorine from HCl plant. 35 tons per/day. HCl for chlorine production is toxaphene byproduct.
Hercules Powder	Wilmington, Del	1,000,000	Chlorine	Plant to convert byproduct HCl to Cl_2. Contract awarded.
Hooker Electrochemical	Montague, Mich	12,000,000	Chlorine—caustic	Under construction. 100,000 tons/year. Complete in 1953.
Hooker Electrochemical	Niagara Falls, N. Y	7,000,000	Chlorine—caustic	Proposed.
Hooker Electrochemical	Tacoma, Wash	5,000,000	Caustic soda, liquid chlorine	Under construction.
Intermountain Chemical	Green River, Wyo	16,000,000	Trona, soda ash	Construction 80% completed. To operate early 1953. Capacity: 1,000 tons refined soda ash daily.
Mathieson Chemical	McIntosh, Ala		Chlorine—caustic	New facilities have almost reached full prod'n.
National Distillers	Ashtabula, Ohio		Sodium, chlorine, sodium peroxide.	Stopped const. of additional sodium cap. Reason: change in long-term needs of one of its major customers.
Pennsalt	Calvert City, Ky	8,000,000	HF, H_2SO_4, chlorine and caustic	Contract awarded. Addition to plant.

CEMENT AND GLASS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Chattanooga Glass	Chattanooga, Tenn	100,000	Glass	Contact awarded. Plant expansion.
Dewey Portland Cement	Davenport, Iowa	2,000,000	Cement	Addition to plant underway.
Gulfport Glass	Gulfport, Miss	200,000	Glass	Contract awarded.
Liberty Glass	Sapulpa, Okla	500,000	Glass	Proposed mfg. plant.
Lone Star Cement	Maryneal, Tex	13,000,000	Cement	Planned to double capacity to produce 1,125,000 bbls./yr.

COKE AND COAL CHEMICALS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Alabama By-Products	Tarrant, Ala	1,778,000	Metallurgical coke	Certificate of necessity awarded.
Allied Chemical & Dye	Chicago, Ill	10,650,000	Coal-tar chemicals	Certificate of necessity awarded.
Allied Chemical & Dy	Detroit, Mich	1,000,000	Naphthalene	Certificate of necessity awarded.
Allied Chemical & Dye (Semet-Solvay Div.)	Ironton, Ohio	1,325,000	Coke	Certificate of necessity awarded.
Allied Chemical & Dye	Kingston, W. Va	5,420,000	Metallurgical coke	Certificate of necessity awarded.
Allied Chemical & Dye	Tonawanda, N. Y	375,000	Coal for chemicals	Certificate of necessity awarded.
Allied Chemical & Dye	Youngstown, Ohio	1,516,000	Coal for chemicals	Certificate of necessity awarded.
American Cyanamid	Bound Brook, N. J	900,000	Naphthalene	Certificate of necessity awarded.
American Steel & Wire	Duluth, Minn	7,280,000	Coke, coal chemicals	Certificate of necessity awarded.
American Steel & Wire of N. J	Cleveland, Ohio	1,450,000	Coke, coal chemicals	Certificate of necessity awarded.
Bethlehem Steel	Baltimore City, Md	6,000,000	Coke, coal chemicals	Certificate of necessity awarded.
Central Iron & Steel	Harrisburg, Pa	30,000,000	Coal chemicals	Proposed plant furnace, 2 open hearths, coke ovens and chem. recovery plant.
Girdler	Louisville, Ky		Activated carbon	Operating. Uses hardwood char.
Great Lakes Carbon	St. Louis, Mo	10,505,000	Metallurgical coke	Certificate of necessity awarded.
Jones & Laughlin	Pittsburgh, Pa		Coke oven	Awarded contract. Battery of chemical-recovery coke ovens.
Kemmerer Coal	Lincoln Co., Wyo	159,000	Coke, coal chemicals	Certificate of necessity awarded.
Koppers	Follansbee, W. Va	207,000	Coal products	Certificate of necessity awarded.
Koppers	Chicago, Ill	196,000	Naphthalene	Certificate of necessity awarded.
Koppers	Fontana, Calif	2,426,000	Naphthalene	Certificate of necessity awarded. Plant went into production July 1952.
Koppers	Follansbee, W. Va	630,000	Naphthalene	Certificate of necessity awarded.
Koppers	Kobuta, Pa	181,000	Benzene and homologues	Certificate of necessity awarded.
Moss Iron	Trafford, Ala	228,000	Coke, coal chemicals	Certificate of necessity awarded.
National Coop. Refinery Assn	McPherson, Kans	2,000,000	Coke oven	Proposed coking unit.
National Steel	Weirton, W. Va	25,000,000	Coke, coal tar chemicals	Certificate of necessity awarded.
Pittsburgh Coke & Chemical	Pittsburgh, Pa	445,000	Activated charcoal	Certificate of necessity awarded.
Pittsburgh Coke & Chemical	Neville Island, Pa	9,150,000	Coke oven products	35 new ovens put into operation, increase tar output by 35%.
Pittsburgh Steel	Monessen, Pa	11,240,000	Metallurgical coke, coal chemicals.	Certificate of necessity awarded.
Productol Co	Santa Fe Springs, Calif		Naphthalene	Opened a plant to make 78 deg. naphthalene; first on West Coast.
Reilly Tar & Chemical	Cleveland, Ohio	1,000,000	Tar products	Planned $1 million. Double facilities. On stream in 1953.
Reilly Tar & Chemical	Granite City, Ill	111,000	Crude naphthalene	Certificate of necessity awarded.
Reilly Tar & Chemical	Indianapolis, Ind	506,000	Crude pyridine	Certificate of necessity awarded.
Tennessee Coal, Iron	Birmingham, Ala	1,150,000	Naphthalene	Certificate of necessity awarded.
U. S. Steel	Clairton, Pa	12,729,000	Coke, coal chemicals	Certificate of necessity awarded.
U. S. Steel	Clairton, Pa	20,888,000	Metallurgical coke	Certificate of necessity awarded.
U. S. Steel	Clairton, Pa	1,200,000	Naphthalene	Certificate of necessity awarded.
U. S. Steel	Cleveland, Ohio	1,700,000	Coke, coal chemicals	Certificate of necessity awarded.
U. S. Steel (Kaiser Steel)	Columbite, Utah	545,000	Coke, coal chemicals	Certificate of necessity awarded.
U. S. Steel	Fairfield, Ala	5,330,000	Coke, coal chemicals	Certificate of necessity awarded.
U. S. Steel	Gary, Ind	14,192,000	Coke oven products	Certificate of necessity awarded. Contract awarded 154 new byproduct coke ovens.
U. S. Steel	Lorain, Ohio	6,303,000	Metallurgical coke, coal chemicals	Certificate of necessity awarded.
Wheeling Steel	Follansbee, W. Va	5,210,000	Coke, coal chemicals	Certificate of necessity awarded.
Youngstown Sheet & Tube	Youngstown, Ohio	10,000,000	Coke-oven products	Adding 76 byproduct coke ovens to increase coking capacity by 35%.



AMMONIUM SULPHATE: Government of India, Sindri, Bihar, India.

DETERGENTS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Continental Oil	Baltimore, Md	.....	Detergent raw materials	Expansion under way; will triple capacity.
Lubrizol	Wickliffe, Ohio	530,000	Lubricating oil detergents	Certificate of necessity awarded.
Nuodex Products	Newark, N. J.	78,000	Aluminum soap	Certificate of necessity awarded.
Oronite Chemical	Oak Point, La	1,594,000	Phenate, sulfonate detergents	Certificate of necessity awarded.
Shell Chemical	Martinez, Calif	790,000	Lubricating oil detergents	Certificate of necessity awarded.
Standard Oil (Indiana)	Whiting, Ind	.....	Detergent base	Planned.
Standard Oil (Indiana)	Woods River, Ill	.....	Motor oil detergent	Plans announced.

FERTILIZERS, AMMONIA, PHOSPHORUS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Allied Chemical & Dye (Nitrogen Div.)	La Platte, Neb	25,000,000	Ammonia and urea fertilizers.	Ground broken. Plant to be completed by 1954. About 100,000 tons/yr.
Allied Chemical & Dye (Nitrogen Div.)	So. Point, Ohio	5,995,000	Fertilizer	Contract awarded. Nitric acidulation process. Complete fertilizer also to be made.
Allied Chemical & Dye	Syracuse, N. Y	24,450,000	Nitrogen fertilizer	Certificate of necessity awarded.
American Agricultural Chemical	Pierce, Fla	876,000	Phosphorus	Certificate of necessity awarded.
American Smelting & Refining, Garfield Chemical & Mfg., Stauffer Chemical	Garfield, Utah	5,000,000	Fertilizer	Plans announced.
Ammonia Chemical Corp. of Calif.	Calif	.....	Ammonia	Seeking incorporation. Project 100 ton/day ammonia plant.
Armour & Co	Bartown, Fla	5,608,000	Phosphate rock	Certificate of necessity awarded.
Associated Cooperatives, Inc	Sheffield, Ala	2,000,000	Phosphate fertilizer	Planned. Will use nitric acidulation at its 60,000 ton-a-yr. unit. Eventually plans to build 60 ton-per-day nitric plant.
Best Fertilizer & Chemical	El Paso, Tex	471,000	Phosphate fertilizer	Certificate of necessity awarded.
Brunswick-Balke-Callender	Muskegon, Mich	175,000	Phosphate rock	Certificate of necessity awarded.
Cities Service	St. Louis, Mo	5,000,000	Ammonia	Certificate of necessity awarded.
Commercial Solvents	Sterlington, La	20,000,000	Solid ammonium nitrate	Scheduled for completion, July 1953. New process. Will double capacity.
Consumers Coop. Ass'n	Lawrence, Kan	16,000,000	Nitrate fertiliser	Planned. Plant to make ammonium nitrates.
Coronet Phosphate	Tenoroc Mine, Fla	850,000	Phosphate rock	Certificate of necessity awarded.
Crescent Chemical	La Porte, Tex	.....	Triple superphosphate	New plant. Capacity: 825 tons/day. Might build sulphuric plant later.
Davison	Lakeland, Fla	.....	Triple superphosphate	Scheduled to be in production by Oct. 1953.
Deere & Co	Pryor, Okla	18,000,000	Ammonia, urea	Contract awarded. Cap: 180 tons of urea/day. To use Pechiney process.
Delta Chemical	Buras, La	9,000,000	Nitrogen fertilizer	Certificate of necessity awarded.
Duval Sulphur & Potash	Carlsbad, N. M	7,500,000	Potash	In operation.
Federal Chemical	Danville, Ill	390,000	Phosphate fertilizers	Certificate of necessity awarded.
Filtrol	Vernon, Calif	5,000,000	Alumina, ammonium sulfate	Construction started Oct. 1952. Will use alumina in its own catalyst manufacture. From waste acidic liquor.
Gulf Improvement	Pascagoula, Miss	20,000,000	Nitro-phosphate fertilizer	Contract awarded.
Gulf States Utilities	Beaumont, Tex	16,500,000	Synthetic ammonia	Proposed.
Hooker Electrochemical	Tacoma, Wash	2,000,000	Anhydrous ammonia	Has begun production. Further expansion being considered.
Interlake Iron	Chicago, Ill	344,000	Ammonium sulphate	Certificate of necessity awarded.
International Minerals & Chemical	North Ft. Worth, Tex	.....	Superphosphate	In operation. 60,000 tons per year. Super & mixed fertilizers.
International Minerals & Chemical	Polk Co., Fla	8,918,000	Phosphate rock	Certificate of necessity awarded.
International Minerals & Chemical	Bonnie, Fla	.....	Dicalcium phosphate	Under construction. Capacity: 100,000 tons/yr. Production to start in early 1953.

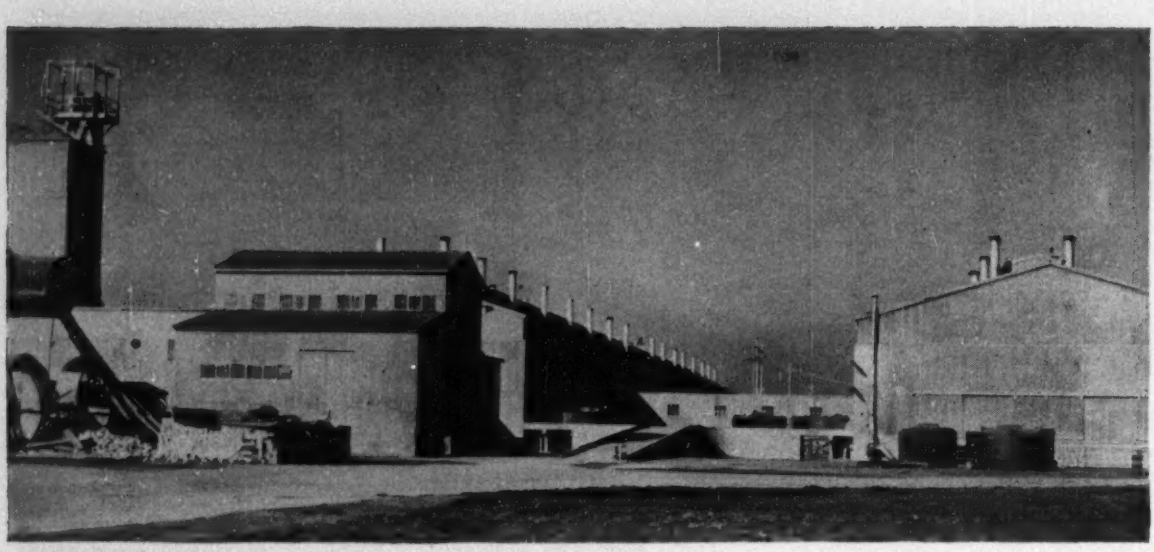
Fertilizers, Ammonia, Phosphorus (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
International Minerals & Chemical	Carlsbad, N. M	.....	Potash	Full scale plant to use new LeBaron-Lawver process to beneficiate potash salts.
Kingsbury	Kingsbury, Ind	500,000	Fertilizer	Contract awarded.
Lion Oil	El Dorado, Ark	30,000,000	Nitrogen fertilizer	Contract awarded.
Lion Oil	Luling, La	.....	Ammonia	Contract awarded. To operate in early 1954. Will include nitric acid plant. To make anhydrous ammonia and prilled ammonium nitrate.
Mathieson Chemical (Govt. contract)	Morgantown, W. Va	.....	Ammonia, methanol	In operation.
Mathieson Chemical	Pasadena, Tex	1,811,000	Phosphate fertilizer	Certificate of necessity awarded.
Mississippi Chemical	Yazoo City, Miss	8,000,000	Anhydrous ammonia	Expansion. Construction begun fall 1952. 120 tons/day ammonia; 150 tons/day ammonium nitrate. Will double present capacity.
Mississippi Chemical	Yazoo City, Miss	2,856,000	Nitric acid, ammonium nitrate	Certificate of necessity awarded.
Mississippi Federated Coops	Canton, Miss	100,000	Fertilizer	Addition. Contract awarded.
Missouri Farmers Assn	Joplin, Mo	3,500,000	Fertilizers	Proposed.
Missouri Farmers Assn	Galena, Kan	3,500,000	Phosphoric acid, triple superphosphate, ammonium phosphate	Announced. Certificate of necessity awarded.
Monsanto	Soda Springs, Idaho	5,000,000	Phosphorus	Will soon open electric furnace, said to be world's largest. Company may soon decide to put in a second similar furnace.
Monsanto	Trenton, Mich	.....	Dicalcium phosphate	New plant began operations. Capacity: 30,000 tons/yr.
National Chemical	Yazoo City, Miss	7,212,000	Nitrogen fertilizer	Certificate of necessity awarded.
Northern Chemical Industries	Sandy Point, Me	2,100,000	Phosphate fertilizer	Proposed. TVA process to make phosphatic fertilizer with nitric acid. $1.5 million for nitric acid plant with cap. of about 16,000 tons/yr. plus $600,000 for fertilizer mixing plant. Present superphosphate facilities to be adapted.
Oklahoma Fertilizer	Oklahoma City, Okla	300,000	Ammonium nitrate, ammonium sulphate	Contract awarded. Immed. const. 20,000 tons.
Pacific Chemical	Franklin Co., Wash	5,735,000	Nitrogen fertilizer	Certificate of necessity awarded.
Pennsalt	Wyandotte, Mich	2,200,000	Ammonia	Contract awarded.
Phillips Chemical	Pasadena, Tex	3,000,000	Triple superphosphate	Will build 405 ton-a-day plant. Contract awarded.
Phillips Chemical	Adams Terminal, Tex	.....	Ammonia	Scheduled to be on stream by end 1953.
Phillips Chemical	Pasadena, Tex	1,468,000	Ammonium sulphate	Certificate of necessity awarded.
Rocky Mountain Chemical	Billings, Mont	8,000,000	Ammonium nitrate	Announced. Capacity: 120 ton/day. Construction to get under way before end of 1952.
Rohm & Haas	Philadelphia, Pa	214,000	Ammonium nitrate	Certificate of necessity awarded.
Shea Chemicals	Columbia, Tenn	3,000,000	Dicalcium phosphate	Ready to get into production. Capacity: 75,000 tons/yr.
Shell Chemical	Ventura, Calif	220,000	Ammonia	Under construction.
Sid Richardson	Pointe a La Hache, La	19,000,000	Ammonia	Certificate of necessity awarded.
Simplot Fertilizer	Pocatello, Ida	1,022,000	Phosphate fertilizer	Certificate of necessity awarded.
Smith-Douglass	Livingston Co., Ill	439,000	Phosphoric acid	Certificate of necessity awarded.
Southwest Fertilizer & Chemical	El Paso, Tex	312,000	20% superphosphate	Announced RFC loan; will use refinery spent acid.
Spencer Chemical	Henderson, Ky	400,000	Nitric acid, ammonium nitrate	Certificate of necessity awarded.
Spencer Chemical	Pittsburg, Kan	1,695,000	Nitric acid, ammonium nitrate	Certificate of necessity awarded.
Spencer Chemical	Vicksburg, Miss	1,175,000	Anhydrous ammonia	Contracts awarded. Will use new partial oxidation process. Plant to be completed by fall of 1953.
Standard Fertilizer	Williamston, N. C	200,000	Fertilizer	Contract awarded. Plant addition.
Stauffer, AS&R and Kennecott	Salt Lake City, Utah	.....	Triple superphosphate	Plant to be completed by summer 1953, will produce 60,000 tons/yr.
Stauffer Chemical	Tacoma, Wash	320,000	Phosphate fertilizer	Certificate of necessity awarded.
Tennessee Corp	East Tampa, Fla	1,671,000	Phosphate fertilizer	Certificate of necessity awarded.
Texas City Chemicals	Texas City, Tex	6,000,000	Phosphate	Construction begun. Operating June 1953. 70,000 tons/day. Dicalcium phosphate plus 3,000 tons/day sodium silicofluoride.
Thurston Chemical	Atlas, Mo	830,000	Phosphate fertilizers	Certificate of necessity awarded.
Thurston Chemical	Joplin, Mo	2,500,000	Fertilizer	Plant addition. Plans announced.
Union Oil	Wilmington, Calif	5,000,000	Ammonia	Certificate of necessity awarded.
Victor Chemical	Chicago Heights, Ill	.....	Dicalcium phosphate	Recently expanded facilities. Capacity: Chicago Heights and Nashville plants now 45,000 tons/yr.
Virginia-Carolina	Nichols, Fla	1,948,000	Phosphate rock	Certificate of necessity awarded.
Virginia-Carolina	Nichols, Fla	4,500,000	Phosphate rock	Certificate of necessity awarded.
W. R. Grace & Co	Memphis, Tenn	15,000,000	Anhydrous ammonia	Proposed. To use Pechiney process.
Western Phosphate	Salt Lake City, Utah	10,000,000	Superphosphate	Jointly owned by Stauffer Chemical and Garfield Chem. & Mfg. to make superphosphate

METALS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Aluminum Co. of America	Bauxite, Ark	54,000,000	Alumina	New facility begins bauxite refining operations.
Aluminum Co. of America	Rockdale, Tex	.....	Aluminum	Production begun. Complete plant will have four pot lines.
Aluminum Co. of America	Skagway, Alaska	400,000,000	Aluminum	400,000,000 lb./yr. aluminum plant, power facilities etc.
Aluminum Co. of America	Wenatchee, Wash	.....	Aluminum	In production. Rated capacity 170 million lbs.
Aluminum Ore	E. St. Louis, Ill	524,000	Alumina	Certificate of necessity awarded.
Aluminum Ore	Mobile, Ala	12,000,000	Alumina	Under construction.
American Smelting & Refining	Barber, N. J	755,500	Selenium	Certificate of necessity awarded.
American Smelting & Refining	Denver, Colo	73,000	Cadmium	Certificate of necessity awarded.
Anaconda Copper Mining	Kalispell, Mont	45,000,000	Aluminum	Contract awarded.
Anaconda Copper Mining	Yerington, Nev	33,000,000	Zinc mining and sulphur	Contract awarded.
Carborundum Metals	Akron, N. Y	2,500,000	Zirconium—hafnium	Construction under way to produce zirconium and hafnium sponge metals, primarily for AEC.
Chemicals Corp	Riverton, Minn	2,000,000	Manganese concentrate	Capacity of semi-commercial plant will be 456,000 long tons 60% manganese concentrate/yr. Will use ammonium carbonate (Dean) process.

Metals (cont.)



SILICOTHERMIC MAGNESIUM: Kaiser Magnesium, Manteca, Calif.

Metals (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Copper Range	Ontonagon Co., Mich.	57,000,000	Copper	Mine facilities, smelter, power plant and townsite. Contract let.
Du Pont	Edgemore, Del. Newport, Del.	15,000,000	Titanium sponge	Expects to begin construction early 1954 on projected expansion. Newport plant will get major increase in capacity.
Foote Mineral	Kings Mountain, N. C.	145,000	Spodumene, columbite, beryllium ore	Certificate of necessity awarded.
Foote Mineral	Kings Mountain, N. C.	225,000	Lithium ores	Certificate of necessity awarded.
Foote Mineral	Sunbright, Va.	3,000,000	Lithium	$3 million mining (N. C.) and extraction expansion under way. Will double U. S. lithium capacity by 1953. (Now over 3,000,000 lb. as carbonate).
Harvey Machine	The Dalles, Ore.	45,000,000	Aluminum	$45 million plant to make 45,000 tons/yr. (Previously announced that Harvey and Anaconda would build plant at Kalispell, Mont. Harvey now says it withdraws from this to go alone.
Howe Sound	Garfield, Utah	.....	Cobalt	Expects to be in production in quantity by April 1953. Capacity: 2,500,000 lb. per year. Uses Chemico process.
Kaiser Aluminum & Chemical	Chalmette, La.	.....	Aluminum	Third and fourth potline on stream. All 8 potlines to be on stream in 1953. Total capacity: 400 million lb aluminum/yr.
Kawecki Chemical	Boyertown, Pa.	25,500	Selenium	Certificate of necessity awarded.
M. A. Hanna	Utah	4,000,000	Ferro-nickel alloy	Planned. To use Bureau of Mines arc-smelting process to make alloy directly from nickel silicate ore.
Olin Industries	E. Alton, Ill.	123,300,000	Aluminum	Certificate of necessity awarded. Plan to turn out 110,000 tons/yr. Sheet and extrusion plants included.
Reynolds Metals	Gum Springs, Ark.	30,000,000	Aluminum	Aluminum reduction plant under construction. Capacity: 110 million lb./yr.
Reynolds Metals	Colbert Co., Ala.	156,000	Cryolite	Certificate of necessity awarded.
Reynolds Metals	Corpus Christi, Tex.	.....	Alumina	New plant under construction. Capacity: 730 million lb./yr.
Reynolds Metals	Corpus Christi, Tex.	80,000,000	Aluminum	Under construction—150 million lb. per year.
Reynolds Metals	Longview, Wash.	7,000,000	Aluminum	Rebuilt potlines increased capacity from 60 million to 100 million lb. pig aluminum per/yr.
Reynolds Metals	Longview, Wash.	1,000,000	Cryolite	To build cryolite recovery unit.
Tenn—Tex Alloy & Chemical	Houston, Tex.	.....	Ferroalloys	In production. Electric furnace. 2,000 tons/year.
Titanium Metals Corp. of America	Henderson, Nev.	.....	Titanium sponge	Plant reaches 4-ton-day capacity. Expanding. Target: 10 tons/day.
Union Carbide	Niagara Falls, N. Y.	529,000	Tungsten metal powders	Certificate of necessity awarded.
U. S. Tin	Seattle, Wash.	250,000	Tin	New smelter to process 5 tons of tin and tungsten concentrates per day. Pilot plant now operating.

OXYGEN, HYDROGEN, NITROGEN, OTHER GASES

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Acetogen Gas	Detroit, Mich.	79,000	Oxygen	Certificate of necessity awarded.
Air Products	Bergen Co., N. J.	58,000	Oxygen, acetylene	Certificate of necessity awarded.
Air Products	Emmaus, Pa.	22,000	Oxygen, acetylene	Certificate of necessity awarded.
Air Products	Iselin, N. J.	19,000	Oxygen	Certificate of necessity awarded.
Air Products	Iselin, N. J.	13,000	Oxygen, acetylene	Certificate of necessity awarded.
Air Products	Parkersburg, W. Va.	30,000	Oxygen, acetylene	Certificate of necessity awarded.
Air Products	Walkerton, Ind.	17,000	Oxygen, acetylene	Certificate of necessity awarded.
Air Products	Weirton, W. Va.	114,000	Oxygen	Certificate of necessity awarded.
Air Reduction	Bethlehem, Pa.	286,000	Oxygen	Certificate of necessity awarded.
Air Reduction	Chicago, Ill.	4,374,000	Liquid O_2, N_2, argon	Certificate of necessity awarded.
Air Reduction	Emeryville, Calif.	79,000	Argon	Certificate of necessity awarded.
Air Reduction	Milwaukee, Wis.	26,000	Argon	Certificate of necessity awarded.

Oxygen, Hydrogen, Nitrogen, Other Gases (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Air Reduction	Philadelphia, Pa.	8,453,000	Liquid O_2, N_2 and argon.	Certificate of necessity awarded.
Air Reduction	Shreveport, La.	66,000	Oxygen	Certificate of necessity awarded.
Air Reduction	Vernon, Calif.	79,000	Argon	Certificate of necessity awarded.
Air Reduction	Lorain, Ohio	18,000	Argon	Certificate of necessity awarded.
Air Reduction	Lorain, Ohio	308,000	Oxygen	Certificate of necessity awarded.
Air Reduction	Los Angeles, Calif.	29,000	Argon	Certificate of necessity awarded.
Alaska Chemical	Fairbanks, Alaska	75,000	Acetylene, oxygen	Certificate of necessity awarded.
Burdett Oxygen	Huntington Park, Calif.	100,000	Oxygen	Certificate of necessity awarded.
Burdett Oxygen	Youngstown, Ohio	497,000	Oxygen, argon, nitrogen	Certificate of necessity awarded. Contract awarded.
Carbon Dioxide & Chemical (Fulton Petroleum)	Wellington, Utah		Carbon dioxide	New dry ice plant and general expansion of natural carbon dioxide operations. Planned for 1953.
Commercial Solvents	Sterlington, La.	1,326,100	Nitrogen solutions	Certificate of necessity awarded. Second unit in operation.
Diamond Alkali	Houston, Tex.	194,000	Hydrogen	Certificate of necessity awarded.
Firth Sterling Steel & Carbide	McKeesport, Pa.	370,000	Oxygen	Certificate of necessity awarded.
Harshaw Chemical	Cleveland, Ohio	275,000	Anhydrous hydrogen fluoride	Certificate of necessity awarded.
Hofman Laboratories	Newark, N. J.	27,000	Liquefied hydrogen	Certificate of necessity awarded.
Home Oxygen	Billings, Mont.	182,000	Oxygen	Certificate of necessity awarded.
Houston Oxygen		1,000,000	Liquid O_2, N_2, plus gaseous O_2, N_2 and argon	Expansion.
Industrial Air Products	Pascagoula, Miss.	208,000	Oxygen, nitrogen	Certificate of necessity awarded.
Industrial Air Products	Panama City, Fla.		Oxygen	Plans announced.
Inland Oxygen-Acetylene	Spokane, Wash.	63,000	Oxygen	Certificate of necessity awarded.
Marks Oxygen	Augusta, Ga.	178,000	Oxygen, acetylene	Certificate of necessity awarded.
National Cylinder Gas	Barberton, Ohio	195,000	Hydrogen	Certificate of necessity awarded.
National Cylinder Gas	Chicago, Ill.	1,492,000	Oxygen	Certificate of necessity awarded.
National Cylinder Gas	Sterling, Ill.	173,000	Oxygen	Certificate of necessity awarded.
San Jacinto, Chem	Houston, Texas	900,000	Nitrogen recovery	Recover 11,500 additional tons per yr.
Shell Oil	Deer Park, Tex.	86,500	Hydrogen sulfide	Certificate of necessity awarded.
Southern Oxygen	Bladensburg, Md.	756,000	Oxygen & hydrogen	Certificate of necessity awarded.
Southern Oxygen	Greensboro, N. C.	31,000	Oxygen	Certificate of necessity awarded.
Southern Oxygen	Kingsport, Tenn.	101,000	Oxygen and hydrogen	Certificate of necessity awarded.
Stuart Oxygen	San Francisco, Calif.	22,000	Hydrogen	Certificate of necessity awarded.
Union Carbide & Carbon (Linde Air Products)	Ashtabula, Ohio		Liquid oxygen	Producing to turn out more than 100 million cu. ft. of oxygen per mo.
Union Carbide and Carbon	Houston, Tex.	681,000	Oxygen, nitrogen	Certificate of necessity awarded.
Union Carbide & Carbon	Los Angeles, Calif.	1,704,000	Oxygen, nitrogen	Certificate of necessity awarded.
Union Carbide & Carbon	Texas City, Tex.	9,040,000	Oxygen, methanol	Certificate of necessity awarded.
Western Oxygen	Seattle, Wash.	52,000	Oxygen	Certificate of necessity awarded.

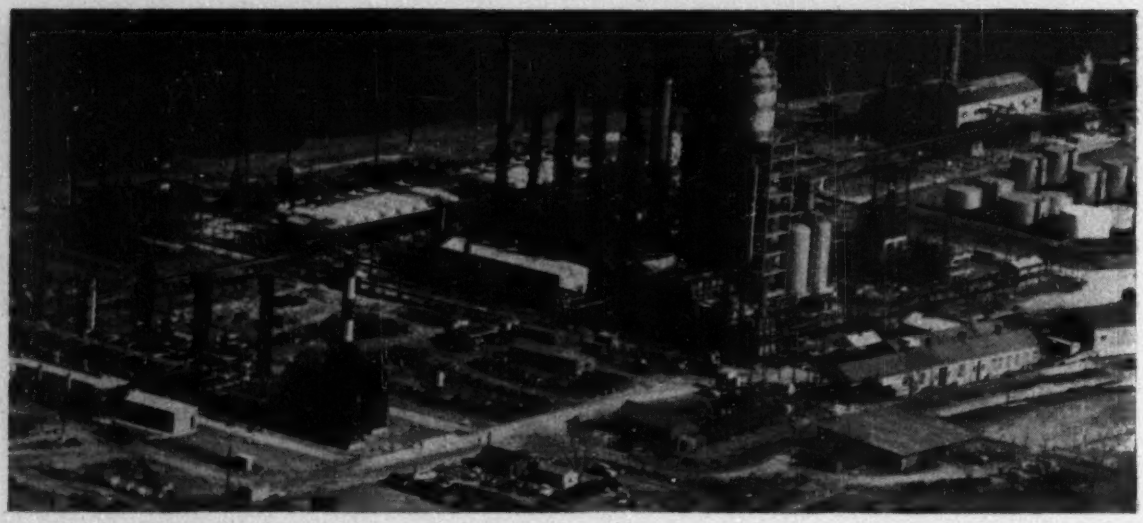
PESTICIDES

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Allied Chemical & Dye	Marcus Hook, Pa.	351,000	Lindane	Certificate of necessity awarded.
Calabama Chemical	McIntosh, Ala.	500,000	Insecticides	Will build.
Diamond Alkali (Kolker Chemical Works)	Houston, Tex.	1,000,000	Lindane	Underway.
Du Pont	La Porte, Tex.	3,500,000	Fungicides	Proposed.
Ethyl	Baton Rouge, La.	2,700,000	Herbicide	Certificate of necessity awarded.
Ethyl	Baton Rouge, La.	2,815,000	Lindane	Certificate of necessity awarded.
Hercules Powder	Henderson, Nev.	1,968,000	Toxaphene	Certificate of necessity awareded.
Hercules Powder	Wilmington, Del.	3,000,000	Insecticides	Proposed.
Hooker Electrochemical	Niagara Falls, N. Y.	412,000	Lindane	Certificate of necessity awarded.
Kolker Chemical (Div. Diamond Alkali)	Houston, Texas	892,000	Lindane	Certificate of necessity awarded.
Monsanto	Nitro, W. Va.	125,000	Herbicide	Certificate of necessity awarded.
Panogen	Boulder Co., Colo.	67,000	Fungicides	Certificate of necessity awarded.
Tennessee Products & Chem.	Chattanooga, Tenn.	217,000	Lindane, Trichlorobenzene	Certificate of necessity awarded.
United States Rubber	Naugatuck, Conn.	779,000	Miticide	Certificate of necessity awarded.

PETROLEUM AND NATURAL GAS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
American Cyanamid	New Orleans, La.	50,000,000	Chem. ex nat. gas	Contract awarded
American Cyanamid	Mt. Pleasant, Tex.	2,128,000	Petroleum products	Contract awarded. Gas production, conc. unit, modification of existing polymerization unit. Thermofor cat. cracker.
Ashland Oil & Refining	Catlettsburg, Ky.	250,000	Refined petroleum	Plant additions. Contract awarded.
Ben. Franklin Refining	Ardmore, Okla.	875,000	Refined petroleum	5,000 bbl. polymerization unit; 6,500 bbl. cat. cracker; 7 million cu. ft./day gas concentration unit.
Cabot Carbon	Bayou Sale, La.	380,000	Carbon black	Certificate of necessity awarded.
Cabot Carbon	Centerville, La.	1,000,000	Carbon black	Certificate of necessity awarded.
Cabot Carbon	St. Mary Parish Co., La.	1,847,000	Carbon black	Certificate of necessity awarded.
Carter Oil	Billings, Mont.		Petroleum products	Contract awarded. Catalytic polymerization unit and other facilities. Polymerization unit capacity; 600 bbl./day of 100-plus polymer.
Celanese	Pampa, Tex.	17,000,000	Acetic acid and anhydride	Petrochemicals plant on stream. Initial products: acetic acid and anhydride.
Cities Service	Terrebonne Parish, La.	2,840,000	Natural gasoline	Natural gasoline plant and facilities.
Cities Service	Blackwell, Okla.	300,000	Natural gasoline	Contract awarded. 200,000 gal. per day.
Cities Service	E. Chicago, Ind.	11,000,000	Petroleum products	Expansion and modernization planned. Double coking capacity. New catalytic reformer. Comp'l. date: end of 1954.
Columbian Carbon Co.	Conroe, Tex.	475,000	Carbon black	Contract awarded. Plant enlargement.
Consumers Coop. Assn.	Phillipsburg, Kan.	2,750,000	Petroleum refining	Contract awarded. Cat. cracker and polymerization unit.
Continental Carbon	Hobbs, N. M.	1,010,000	Carbon black	Certificate of necessity awarded.
Continental Carbon	Sunray, Tex.	185,000	Carbon black	Certificate of necessity awarded.
Continental Oil	Houston, Tex.	15,000,000	Petrochemicals	Planned.

Petroleum and Natural Gas (cont.)



BENZENE, TOLUENE: Eastern States Petroleum, Houston, Tex.

Petroleum and Natural Gas (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Continental Oil	Lake Charles, La	750,000	Refined petroleum	Contract awarded. Platforming units.
Continental Oil	Ponca City, Okla	7,500,000	Refinery	Planned expansion. Will include lube oil additives.
Continental Oil	Westlake, La	3,000,000	Refined petroleum	Contract awarded. Refinery additives.
Continental Oil Black	Westlake, La	1,647,000	Carbon black	Certificate of necessity awarded.
Deep Rock Oil	Cushing, Okla	2,225,000	Refined petroleum	Contract awarded for lube oil refining unit.
Delta Refining	Memphis, Tenn	1,500,000	Cat. cracking	Cat. cracker, crude oil unit, etc. Contract let.
Eastern States Petroleum	Houston, Tex	3,750,000	Refined petroleum	Contract awarded. Will rehabilitate and reactivate HF alkylation unit, refinery, and Udex unit. Also expand fluid cat. cr. unit.
El Dorado Refining	El Dorado, Kan	3,500,000	Refined petroleum	Contract awarded for refinery.
El Paso Natural Gas	Farmington, N. M	11,500,000	Natural gasoline	Additional absorption facilities and dehydration facilities.
Florida Petrochemicals	Port Everglades, Fla	6,000,000	Petrochemicals	Oil cracking plant. 4,000 bbl. crude/day. Under construction. Ugite method. On stream by Oct. 1953.
General Petroleum	Ferndale, Wash	35,000,000	Petroleum products	First full scale oil refinery in Pacific Northwest. Capacity: 35,000 bbl./day; cost $35 million. Comp'l. date: 1954.
Gulf Oil	Philadelphia, Pa	10,000,000	Petroleum products	Contract awarded. Crude oil refinery.
Gulf Oil	Philadelphia, Pa	229,000	Propane, propylene	Certificate of necessity awarded.
Gulf Oil	Port Arthur, Tex	507,000	Petroleum products	Contract awarded. To improve and enlarge refinery.
Gulf Oil	Port Arthur, Tex	.....	Gasoline	Will build propylene polymerization unit.
Hancock Oil	Long Beach, Calif	4,000,000	Ethylene glycol	Under construction. Licensed et-glycol process from Societe Carbochemique. Also et. oxide and ethanolamines.
Humble Oil & Refining	Baytown, Tex	7,500,000	Petrochemicals	Petrochemical plant $5,750,000; alkylation refining unit $1,750,000.
Humble Oil & Refining	Baytown, Tex	4,800,000	Petroleum products	Will add catalytic polymerization unit. Constr. to begin early 1953.
Humble Oil & Refining	Baytown, Tex	85,000	Butylene	Certificate of necessity awarded.
Kerr-McGee	Etter, Tex	850,000	Natural gas	Contract awarded.
Lion Oil	El Dorado, Ark	.....	Alkylate	Sulphuric alkylation plant. 1,150 bbl/day. Oper. late 1953.
Lion Oil	El Dorado, Ark	300,000	Liquefied petroleum gases	Certificate of necessity awarded.
Lion Oil	El Dorado, Ark	.....	Cracked petroleum	5,000 bbl./day fluid cat. cracker. Oper. late 1953.
Lion Oil	Luling, La	31,000,000	Petrochemicals	Proposed.
Lone Star Gas	Dallas, Tex	300,000	Natural gas	Enlargement underway.
Lone Star Gas	Pauls Valley, Okla	370,000	Natural gasoline	Contract awarded. Dehydration plant.
Lone Star Producing	Bronte, Tex	3,000,000	Gas plant	Daily capacity 30 million cu. ft./day. Underway.
Magnolia Petroleum	Beaumont, Tex	7,821,000	Gasoline	Expansion announced.
Magnolia Petroleum	Beaumont, Tex	2,225,000	Jet fuel and aviation gas	25,000 bbl./day feed prep. system. Planned.
Magnolia Petroleum	Midland, Tex	3,500,000	Gasoline	Contract awarded.
Mathieson	Brandenburg, Ky	17,000,000	Ethylene chemicals, propane, butane, natural gasoline	Full production.
Midland Coop	Cushing, Okla	3,500,000	Petroleum refining	Cracking unit and storage plant. Contract awarded.
Morton Withers Chemical	Greensboro, N. C	1,776,000	Petroleum sulfonate	Certificate of necessity awarded.
National Petro-Chemical	Tuscola, Ill	37,000,000	Synthetic ethanol	New plant to go on stream mid-1953. Capacity: 40,000,000 gal./yr. Also ethyl chloride, propane, butane, natural gas.
Natural Gasoline	Hawkins, Tex	375,000	Natural gasoline	Contract awarded. Plant addition.
Ohio Oil	Robinson, Ill	5,000,000	Petroleum products	Awarded contract for Houdriforming unit. Capacity: 8,000 bbl./day.
Old Dutch Refining	Muskegon, Mich	326,000	Benzene, toluene	Certificate of necessity awarded.
Pan Am Southern	Destrehan, La	500,000	Fluid hydroformer	On stream, Dec. 1952.
Phillips Chemical	Borger, Tex	2,875,000	Carbon black	Certificate of necessity awarded.
Phillips Petroleum	Phillips, Tex	454,000	Petroleum products	Contract awarded. To improve aviation alkylate plant.
Phillips Petroleum	Woods Cross, Utah	10,000,000	Petroleum products	New cat. cracking plant that doubles the refinery's run of crude oil completed.

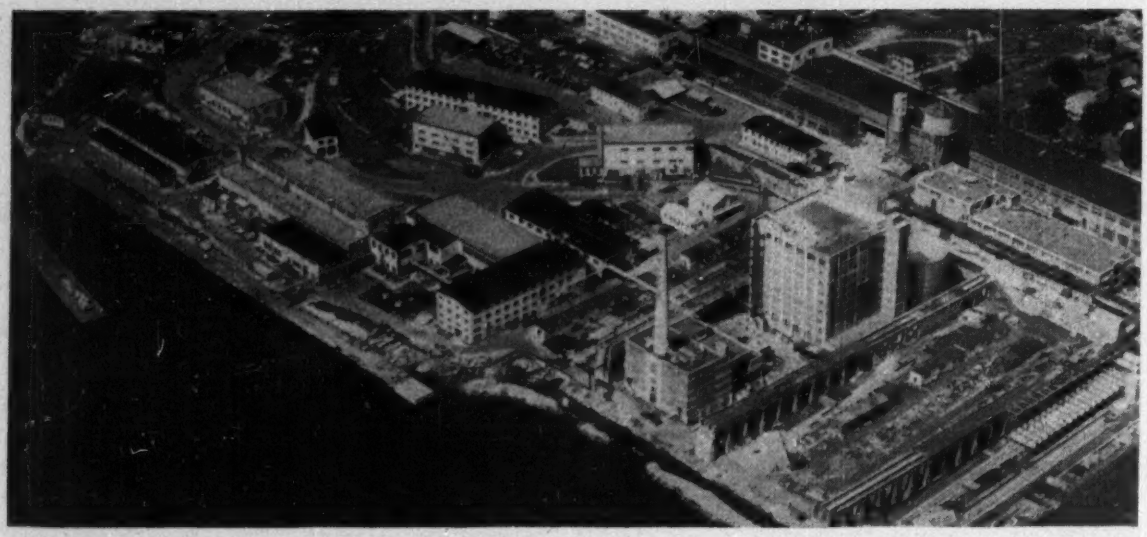
Petroleum and Natural Gas (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Pontiac Refining	Corpus Christi, Tex	2,000,000		Proposed aviation gas refinery unit.
Pontiac Refining	Corpus Christi, Tex	300,000	Petroleum products	Refinery enlargement. Contract awarded.
Premier Petroleum	Fort Worth, Tex	1,300,000	Petroleum refining	Proposed cat. cracker and polymerization unit.
Proven Oil & Refining	Florence, Ariz	18,000,000	Petroleum products	Contract awarded for oil refinery.
Pure Oil	Smiths Bluff, Tex	6,950,000		Contract awarded. 26,000 bbl./day refinery expansion (fluid cat. crackers, polymerization unit; 20,000 bbl. vacuum—flash ref. unit).
Reef Fields Gasoline	Big Spring, Tex	2,225,000	Natural gasoline	Contract awarded.
Republic Oil Refining	Texas City, Tex	3,550,000		Proposed. Crude distillations unit.
Republic Oil Refining	Texas City, Tex	1,775,000	Refined petroleum	Platforming unit. Capacity 6,500 bbl./day. Contract awarded.
Richfield Oil	Watson, Calif	40,000,000	Petroleum products	Work started—to be completed in 1954. Will increase capacity for aviation gasoline to 500,000 gal./day and for other gasoline to 2,750,000 gal./day.
Shamrock Oil & Gas	Dumas, Tex	2,300,000	Petroleum products	Contract awarded. Alkylation plant.
Shamrock Oil & Gas	Sunray, Texas	2,250,000	Petroleum hydrocarbons	Completed.
Sid Richardson Carbon	Fort Worth, Tex	2,000,000	Carbon black & synthetic rubber.	Proposed.
Signal Oil & Gas & Honolulu Oil	Ropesville, Tex	1,225,000	Petroleum products	Contact awarded. Gasoline plant.
Sinclair Refining	E. Chicago, Ind	400,000	Petroleum products	Contract awarded.
Sinclair Refining	La Porte, Tex	10,525,000	Refined petroleum	Contract awarded. Fluid cat. cracker ($8,775,000) and crude distillation unit (1,750,000).
Socony-Vacuum (General Petroleum)	Torrance, Calif		Petroleum products	Contract awarded for new thermofor cat. reformer. Capacity: 1,900 bbl./day.
Southern Production & Humble Oil & Refining	Angleton, Tex	4,775,000	Petroleum products	Contract awarded. High-pressure absorption-type gasoline refining plant.
Southwestern Oil & Refining	Corpus Christi, Tex	850,000	Refined petroleum	Contract awarded. Expanding refinery.
Standard Oil	Lima, Ohio	10,900,000	Refined petroleum	Cat. reforming unit and addition to crude coking unit; $8.5 million, $2.4 million respectively.
Standard Oil	El Segundo, Calif	20,000,000	Petroleum products	Announced $20 million cat. cracking unit to convert heavy fuel oil into aviation gas and high-octane automobile gasoline. Capacity: 36,000 bbl./day.
Standard Oil (N. J.)	Baton Rouge, La	10,570,000	Petroleum, chemical products	Certificate of necessity awarded.
Standard Oil (N. J.)	Baton Rouge, La	326,000	Octyl alcohol	Certificate of necessity awarded.
Standard Oil (N. J.)	Baton Rouge, La	2,800,000	Petroleum resin	Certificate of necessity awarded.
Standard Oil (N. J.)	Linden, N. J.	7,629,000	Isobutylene, polybutene, lubricating oil additives	Certificate of necessity awarded.
Standard Oil (N. J.)	Norfolk, Va	50,000,000	Refined petroleum	Oil refinery. Plans announced.
Standard Oil of Texas	El Paso, Tex	10,000,000	Petroleum products	Completed expansion, including Houdriflow cat. cracker, alkylation, etc.
Sun Oil	Marcus Hook, Pa	3,258,000	Acid oils	Certificate of necessity awarded.
Sun Oil	Toledo, Ohio	3,500,000	Octane gasoline	Cat. naphtha reformer, 10,000 bbl. capacity. Contract awarded.
Suntide Refining	Corpus Christi, Tex	14,000,000	Petroleum products	Contract awarded. Crude oil refinery.
Sunray Oil	Corpus Christi, Tex	16,000,000	Cat. cracking	Construction begun. 25,000 bbl./day crude.
Tex Harvey Gasoline	Midland, Tex	4,750,000	Gasoline	Contract awarded.
Texas City Refining	Texas City, Tex	2,350,000	Refined petroleum	For 19,000 bbl. capacity Houdriflow cat. cracking unit. Contract awarded.
Texas Co	Amarillo, Tex	19,750,000	Refined petroleum	Proposed aviation gas refinery.
Texas Co	Scurry Co., Tex	1,000,000	Petroleum products	Certificate of necessity awarded for propane, butane and natural gasoline.
Thermatomic Carbon	Sterlington, La	1,184,000	Carbon black	Certificate of necessity awarded.
Tidewater Associated Oil	Drumright, Okla	1,650,000	Refined petroleum	Contract awarded crude distillation unit.
U. S. Govt. (Bureau of Mines)	Rifle, Colo	334,000	Shale oil	New experimental extraction retort completed. To process 160-400 tons of oil shale/day. Go on stream Jan. 1953.
U. S. Govt. (Longhorn Ordnance Works)	Daingerfield, Tex	1,000,000	Rocket fuel	Proposed.
Union Oil	Wilmington, Calif	1,800,000	Gasoline	Contract awarded for 17 gasoline refinery units.
United Carbon	St. Mary Parish, La	2,655,000	Carbon black	Certificate of necessity awarded.
United Carbon	Wheeler, Tex	1,907,000	Carbon black	Certificate of necessity awarded.
Warren Petroleum	Gervin Co., Okla	1,000,000	Petroleum products	Certificate of necessity awarded for propane, butane and natural gasoline.
West Coast Pipe Line	Florence, Ariz	3,000,000	Petroleum products	Proposed new refinery.
Western States Refining	North Salt Lake City, Utah	1,100,000	Refined petroleum	Contract awarded for Houdriflow cat. cracker.

PHARMACEUTICALS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Abbott	No. Chicago, Ill	300,000	Pharmaceuticals	Certificate of necessity awarded.
American Cyanamid	Pearl River, N. Y	5,280,000	Antibiotics	Certificate of necessity awarded.
American Cyanamid	Pearl River, N. Y	3,200,000	Special vaccines	Certificate of necessity awarded.
Bristol Labs	East Syracuse, N. Y	9,204,000	Antibiotics	Certificate of necessity awarded.
Chas. Pfizer	Long Island, N. Y	4,850,000	Antibiotics	Certificate of necessity awarded.
Chas. Pfizer	Groton, Conn	7,300,000	Penicillin	Certificate of necessity awarded.
Chlorophyll Chemical	McAllen, Tex		Chlorophyllin	Converting from production of carotene to chlorophyllin; efficiency of chromatographic process raised to 93%. Est. capacity: 500 lb./mo.
Commercial Solvents	Terre Haute, Ind	252,000	Penicillin	Certificate of necessity awarded.
Commercial Solvents	Terre Haute, Ind	26,000	Bacitracin	Certificate of necessity awarded.
Commercial Solvents	Terre Haute, Ind	1,500,000	Dextran	Completed. Capacity over 1 million pints annually.
Commercial Solvents	Terre Haute, Ind	109,000	Dextran Plasma Extender	Certificate of necessity awarded. Expanding production
Cudahy Packing	Omaha, Nebr	110,000	Pharmaceuticals	Contract awarded.
E. R. Squibb	New Brunswick, N. J	3,443,000	Antibiotics	Certificate of necessity awarded.
Eli Lilly	Indianapolis, Ind	1,426,000	Penicillin and streptomycin	Certificate of necessity awarded.
Merck	Danville, Pa	715,000	Niacin	Certificate of necessity awarded.
Merck	Danville, Pa	1,292,000	Antibiotics	Certificate of necessity awarded.
Merck	Danville, Pa	979,000	Cortisone	Certificate of necessity awarded.

Pharmaceuticals (cont.)



TERRAMYCIN: Chas. Pfizer, Groton, Conn.

Pharmaceuticals (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Merck	Danville, Pa	.....	Cortisone	On stream. Construction begun in Dec. 1950.
Merck	Rahway, N. J	362,000	Cortisone	Certificate of necessity awarded.
Monsanto	St. Louis, Mo	18,415,000	Cortisone	Certificate of necessity awarded. No construction plans announced.
National Drug	Swiftwater, Pa	83,000	Vaccines and antibiotics	Certificate of necessity awarded.
New York Quinine & Chemical	Newark, N. J	314,000	Opium derivs	Certificate of necessity awarded.
Pacific Yeast	Wasco, Calif	.....	Vitamin B_{12}	In full operation. Capacity increased over 200%. Uses new semi-continuous fermentation process
Parke Davis	Detroit, Mich	18,452,000	Penicillin	Certificate of necessity awarded.
R. K. Laros	Bethlehem, Pa	.....	Dextran	Under construction.
Sterling Drug	Cincinnati, Ohio	104,000	Anti-malarial drug components	Certificate of necessity awarded.
Sterling Drug	Cincinnati, Ohio	47,400	Anti-malarial drugs	Certificate of necessity awarded.
Upjohn	Kalamazoo, Mich	6,900,000	Cortisone, antibiotics	3,500,000 cortisone plant; 3,400,000 antibiotics plant announced. Fermentation process simplifying hitherto completed cortisone synthesis.
Warner–Hudnut	Morris Plains, N. J	2,500,000	Pharmaceutical products	Contract awarded.
Western Condensing	Appleton, Wis	355,600	Penicillin lactose	Certificate of necessity awarded.
Western Condensing	Wausau, Wis	288,000	Penicillin lactose	Certificate of necessity awarded.
Wyeth	West Chester, Pa	4,837,000	Antibiotics	Certificate of necessity awarded.
Wyeth	Marietta, Pa	307,000	Antitoxins and biologicals	Certificate of necessity awarded.

PIGMENTS AND DYES

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
American Cyanamid	Bound Brook, N. J	955,000	Military textile dye	Certificate of necessity awarded.
American Cyanamid	Savannah, Ga	13,875,000	Titanium dioxide	Certificate of necessity awarded.
American Pigment	Hiwasse, Va	125,000	Iron oxide pigments	Certificate of necessity awarded.
Du Pont	Deepwater Point, N. J	1,786,000	Ponsol dyes	Certificate of necessity awarded.
J. M. Huber	Havre de Grace, Md	.....	Pigments	In operation.
National Lead	St. Louis, Mo	151,000	Silicate white lead	Certificate of necessity granted.
National Lead	Philadelphia, Pa	106,000	Lead compounds	Certificate of necessity awarded.
Pennsalt	Wyandotte, Mich	283,000	Tropical bleach for military	Certificate of necessity awarded.
Southern Dyestuffs	Charlotte, N. C	250,000	Dyestuffs	Expanding.
Stabilized Pigments	Piscataway, N. J	.....	Red iron oxide	Expanded capacity from 80 to 200 tons per month.

PLASTICS AND RESINS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Aume Resin	Chicago, Ill	318,000	Resins	Certificate of necessity awarded.
Allied Chemical & Dye	Lawrence County, Ohio	4,200,000	Urea	Certificate of necessity awarded.
Allied Chemical & Dye (Semet-Solvay)	Tonawanda, N. Y	.....	Polyethylene	Initial product; polyethylene wax.
American Cyanamid	Avondale, La	7,500,000	Urea	Certificate of necessity awarded.
American Cyanamid	Azusa, Calif	.....	Polyester resins	Expanded facilities in operation.
American Cyanamid	Wallingford, Conn	881,000	Melamine resins	Certificate of necessity awarded.
American Polymer Corp	Peabody, Mass	89,000	Plastics	Certificate of necessity awarded.
Hendix Aviation (Marshall Eclipse Div.)	Green Island, Troy, N. Y	.....	Phenolic and other resins	Contract awarded.
B. F. Goodrich Chemical	Calvert City, Ky	5,871,000	Vinyl resins	Certificate of necessity awarded.
Buckeye Cotton Oil	Memphis, Tenn	.....	Carboxy methycellulose	In production. Uses chloracetic acid in continuous process.
Carbide & Carbon Chemical	Kanawha County, W. Va	1,082,000	Styrene	Certificate of necessity awarded.
Catalin Corp. of America	Calumet City, Ill	125,000	Polystyrene	Contract awarded.
Catalin Corp.	Fords, N. J	300,000	Phenolic resins	Certificate of necessity awarded.
Diamond Alkali	Deer Park, Houston, Tex	2,526,000	Vinyl resins	Certificate of necessity awarded.
Dow Chemical	Allyn's Point, Conn	9,982,000	Vinyl resins	Certificate of necessity awarded.
Dow Chemical	Allyn's Point, Conn	.....	Polystyrene	In operation. Styrene monomer shipped from Freeport, Tex.

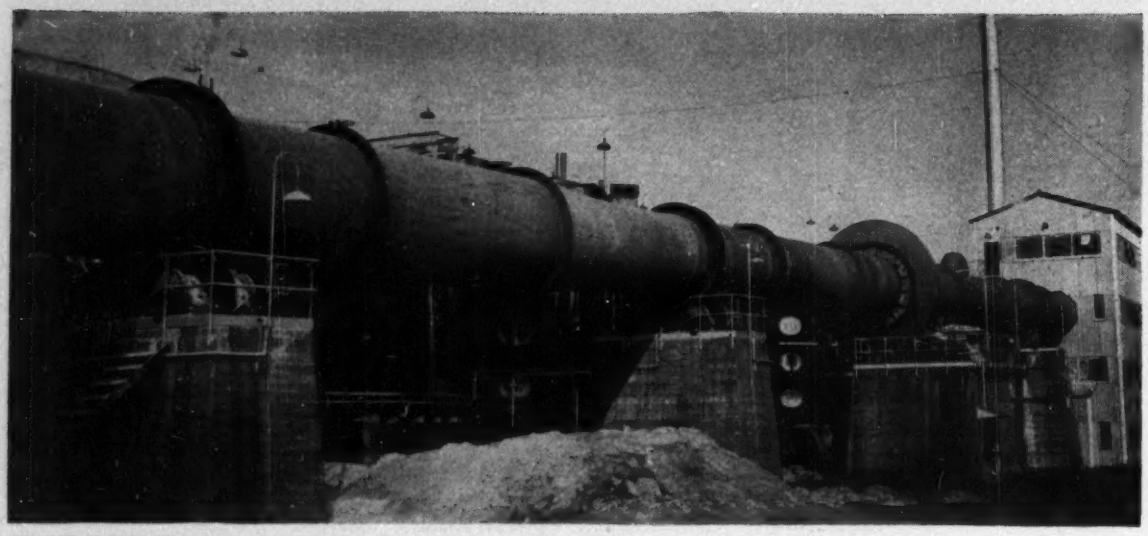
Plastics and Resins (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Dow Chemical	Freeport, Texas	5,930,000	Vinyl resins	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	.....	Polyvinyl chloride	Expected to have plant operating summer 1952.
Dow Chemical	Midland, Mich	10,308,000	Vinyl resins	Certificate of necessity awarded.
Dow Corning	Midland, Mich	13,000,000	Silicone materials	Under construction. Complete 1954. 4X pres. capacity; includes basic silicone fluids and resins, metallic silicon, methyl chloride, silicone rubber.
Du Pont	Beaumont, Tex	100,000,000	Plastics and chemicals	Proposed. Land purchased, expansion.
Du Pont	Circleville, Ohio	10,000,000	Polyester film	Begin const. early 1953. First commercial plant to make its new polyethylene terephthalate film. In operation early 1955.
Du Pont	Orange, Tex	10,000,000	Polyethylene	Enlarge plant. Proposed.
Du Pont	Orange, Tex	4,549,000	Adipic acid and hexamethylene diamine	Contract awarded.
Du Pont	Parkersburg, W. Va	514,000	Fluoroethylene	Certificate of necessity awarded.
Durez Plastics & Chemicals	North Tonawanda, N. Y.	3,347,000	Phenolic resins	Certificate of necessity awarded.
Firestone Tire & Rubber	Pottstown, Pa	6,022,000	Vinyl resins	Certificate of necessity awarded.
General Electric	Anaheim, Calif	.....	Polyesters	In production.
General Electric	Waterford, N. Y.	5,000,000	Silicones	Contract awarded. Plant addition.
General Tire & Rubber	Calvert City, Ky.	5,319,000	Vinyl resins	Certificate of necessity awarded.
General Tire & Rubber	Calvert City, Ky.	6,500,000	Vinyl resins	Planned. New plant.
Hercules Powder	Brunswick, Ga	1,240,000	Pine oil, turpentine, resins and paracymene	Certificate of necessity awarded.
Hercules Powder	Hopewell, Va	1,316,000	Nitrocellulose products and nitrocellulose	Certificate of necessity awarded.
Heresite & Chemical	Manitowoc, Wis	75,000	Phenolic resins	Certificate of necessity awarded.
Hooker-Detrex	Ashtabula, Ohio	192,500	Trichlorethylene	Certificate of necessity awarded.
Hooker-Detrex	Tacoma, Wash	337,000	Trichlorethylene	Certificate of necessity awarded.
Linde Air Products	Tonawanda, N. Y.	751,000	Silane, silicones	Certificate of necessity awarded.
M. W. Kellogg	Jersey City, N. J.	1,000,000	Kel-F	Building. Up to 1½ million lb./yr.
Marbon Corp	Gary, Ind	70,000	Styrene	Certificate of necessity awarded.
Monsanto	Addyston, Ohio	.....	Styrene and phenolic resins	Completed.
Monsanto	Cincinnati, Ohio	.....	Plastics	Production started.
Monsanto	Indian Orchard, Mass	2,700,000	Polyvinyl chloride film	Expanding.
Monsanto	Port Plastics, Ohio	.....	Resins & Plastics	In production.
Monsanto	Springfield, Mass	1,190,000	Polyvinyl chloride	Certificate of necessity awarded.
Monsanto	Texas City, Tex	7,340,000	Vinyl chloride	Certificate of necessity awarded.
Monsanto	Texas City, Tex	3,681,000	Vinyl resins	Certificate of necessity awarded.
National Starch Products	.....	2,000,000	Vinyl acetate, polymers and copolymers	Under construction. Expansion doubled.
National Starch Products	Plainfield, N. J.	253,000	Vinyl resins	Certificate of necessity awarded.
Pathfinder Chemical	Point Pleasant, W. Va	2,000,000	Polystyrene resins	Certificate of necessity awarded.
Reichhold Chemicals	Detroit, Mich	.....	Phenolic resins	Greatly increased capacity. Completed.
Reichhold	Houston, Texas	3,250,000	Resins and phenolic products	Proposed.
Shawinigan Resins	Springfield, Mass	498,000	Polyvinyl formal, butyral resins	Certificate of necessity awarded.
Shawinigan Resins	Springfield, Mass	322,000	Polyvinyl alcohol	Certificate of necessity awarded.
Shawinigan Resins	Springfield, Mass	1,053,000	Vinyl resins	Certificate of necessity awarded.
Shell Chemical	Houston, Tex	4,762,000	Epon resins	Certificate of necessity awarded.
Snyder Chemical	Bethel, Conn	77,000	Phenolic resins	Certificate of necessity awarded.
Standard Oil of Calif	Richmond, Calif	4,000,000	Phenol	Contract awarded. Construction to start by early 1953.
Strux	Lindenhurst, N. Y.	123,000	Cellulose acetate	Certificate of necessity awarded.
Tennessee Eastman	Kingsport, Tenn	5,620,000	Cellulose esters	Certificate of necessity awarded.
Texas Eastman	Harrison, Tex	3,800,000	Synthetic hard wax	Certificate of necessity awarded.
Texas Eastman	Harrison, Tex	7,000,000	Polyethylene	Certificate of necessity awarhed.
Thiokol	Harrison, Tex	400,000	Liquor polymer	DPA loan granted.
Thiokol	Moss Point, Miss	1,000,000	Synthetic latices	Certificate of necessity awarded.
Union Carbide	Bound Brook, N. J.	1,886,000	Polystyrene resins and polyester resins	Certificate of necessity awarded.
Union Carbide & Carbon	Los Angeles Co., Calif	36,323,000	Polyethylene	Certificate of necessity awarded. 50–60 million lb. plastic; 5–10 million lb. ethylene glycol.
Union Carbide & Carbon (Bakelite Div.)	Marietta, Ohio	5,740,000	Phenolic resins	Certificate of necessity awarded.
Union Carbide	So. Charlestown, W. Va	1,406,000	Polyethylene	Certificate of necessity awarded.
Union Carbide & Carbon (Carbide & Carbon)	Charleston, W. Va	1,315,000	Polychlorotrifluoroethylene	Announced. To expand capacity.
Union Carbide (Carbide & Carbon)	Texas City, Tex	3,350,000	Polyethylene	Contract awarded. Complete early 1953. Certificate of necessity awarded. Carbide's and Du Pont's capacity an est. 100–150 million lb./yr. end 1952.
Union Carbide & Carbon	Texas City, Tex	13,837,000	Vinyl resins	Certificate of necessity awarded.
Union Carbide & Carbon (Carbide & Carbon)	Torrance, Calif	36,000,000	Ethylene glycol and polyethylene	Announced. Capacity: 50–60 million lb. of polyethylene and 5–10 million lb. ethylene glycol annually.
U. S. Rubber (Naugatuck Chem.)	Naugatuck, Conn	.....	Polyester resins	Possible doubling plant capacity. Nothing definite.
U. S. Rubber (Naugatuck Chem.)	Painesville, Ohio	3,298,000	Vinyl resins	To double capacity. Est. new capacity: more than 50,000,000 lb./yr. Complete June, 1953.
U. S. Plywood	Portland, Ore	57,000	Phenolic resins	Certificate of necessity awarded.

PULP AND PAPER

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
American Reinforced Paper	Tracy, Calif	527,000	Paper products	Contract awarded.
Anacortes Veneer	Anacortes, Wash	1,000,000	Hardboard	In productions. Uses new semi-process.
Bowater Southern Paper	Charleston, Tenn	15,000,000	Sulphate pulp and newsprint	Contract awarded. Plant to be on Hiwassee River.
Crown Zellerbach (Western Waxed Paper)	San Leandro, Calif	350,000	Paper products	Contract awarded. Expansion.
East Texas Pulp & Paper	Jasper Co., Tex	2,000,000	Pulp & paper	Newly-formed company. Cap.: 90,000 tons paper/year.
Everett Pulp & Paper	Everett, Wash	2,000,000	Pulp & Paper	Plant addition. Contract awarded.
Great Northern Paper	Millinocket, Me	6,000,000	Pulp & Paper	Proposed kraft mill.
Oxford Paper	Rumford, Me	500,000	Bleached paper	Proposed 5-story bleachery.

Pulp and Paper (cont.)



KRAFT PULP: Fibreboard Products, Antioch, Calif.

Pulp and Paper (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Pollock Paper	Dallas, Tex	304,000	Paper products	Contract awarded.
Procter & Gamble (Buckeye Cellulose)	Foley, Fla	20,000,000	Pulp (nitrating and dissolving)	Pulp plant under construction.
Rayonier	Jesup, Ga	25,000,000	Chemical cellulose	Building plant primarily for rayon. 87,000 tons per yr.
Rhinelander Paper	Rhinelander, Wis		Semichemical pulp	Building started on 40 ton/day semichemical pulp plant; will use aspen wood.
St. Mary's Kraft	St. Mary's Ga	1,350,000		Proposed additions to sulphate pulp and kraft mill.
Southern Paperboard	Savannah, Ga	5,600,000	Paper products	Additions to plant.
Southland Paper Mills	Harty, Tex	15,050,000	Paper	Proposed new mill.
West Virginia Pulp & Paper	Covington, Va	100,000	Paper products	Contract awarded. Plant additions.

REFRACTORIES

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Corhart Refractories	Louisville, Ky	1,000,000	Furnace linings	Plant to manufacture linings for steel furnaces. Contract awarded.
Kaiser Aluminum & Chemical	Salinas, Calif	1,746,200	Magnesite	Certificate of necessity awarded.
Norton	Worcester, Mass	654,000	Silicon carbide grain	Certificate of necessity awarded.
Standard Slag	Cabba, Nev	451,000	Refractory magnesite	Certificate of necessity awarded.

RUBBER

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Armstrong Rubber Mfg	Des Moines, Iowa	2,500,000	Rubber products	Proposed plant expansion.
B. F. Goodrich	Miami, Okla	3,000,000	Tires	Tire manufacturing plant. Underway.
Goodrich-Gulf Chem	Orange, Tex		Butyl rubber	Announced. To build first plant here. Will produce under Esso patents.
Goodyear Tire & Rubber	Akron, Ohio	1,500,000	Chemigum synthetic rubber.	Planned expansion.
Goodyear Tire & Rubber	Windsor, Vt	350,000	Rubber products	Contract awarded.
Kentucky Synthetic Rubber	Louisville, Ky	1,300,000	Synthetic rubber	Conversion to production of cold GR-S rubber.
U. S. Rubber (Naugatuck Chemical)	Port Neches, Tex	2,500,000	GR-S synthetic rubber	Production of cold rubber to begin Jan. 1953, to reach full production in Feb. To turn out 7,500 long tons of cold rubber/mo.

SULPHUR AND SULPHURIC

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Allied Chemical & Dye	Monument, N. Mex	80,000	Sulphur	Certificate of necessity awarded.
Allied Chemical & Dye	River Rouge, Mich	406,000	Sulphuric acid	Certificate of necessity awarded.
American Aniline Products	Lock Haven, Pa	204,000	Sulphuric acid	Certificate of necessity awarded.
American Zinc Co. of Ill	Dumas, Tex	4,372,000	Sulphuric acid	Certificate of necessity awarded.
American Zinc of Ill	Fairmont City, Ill	355,000	Sulphuric acid	Certificate of necessity awarded.
Anaconda	Alpine Co., Calif	1,550,000	Sulphuric acid	Certificate of necessity awarded.
Blockson Chemical	Joliet, Ill	4,000,000	Sulphuric acid	Certificate of necessity awarded.
Bunker Hill & Sullivan	Kellogg, Idaho		Sulphuric acid	300 tons/day plant. Scheduled in production by late 1953.
Chemical Corp. of America	Sulphurdale, Utah	300,000	Sulphur	Building plant. 100 tons per day ore of 25% brimstone.
Consolidated Chemical Industries	Baton Rouge, La	3,000,000	Sulphuric acid	Complete Oct. 1952. Process 400 tons/per day from refinery sludge. Largest regeneration plant.
Consolidated Chemical Industries & Humble Oil Co.	Baytown, Tex	4,750,000	Sulphuric acid	Contract awarded. 600 short tons/day. Plant scheduled to go on stream by end 1953.

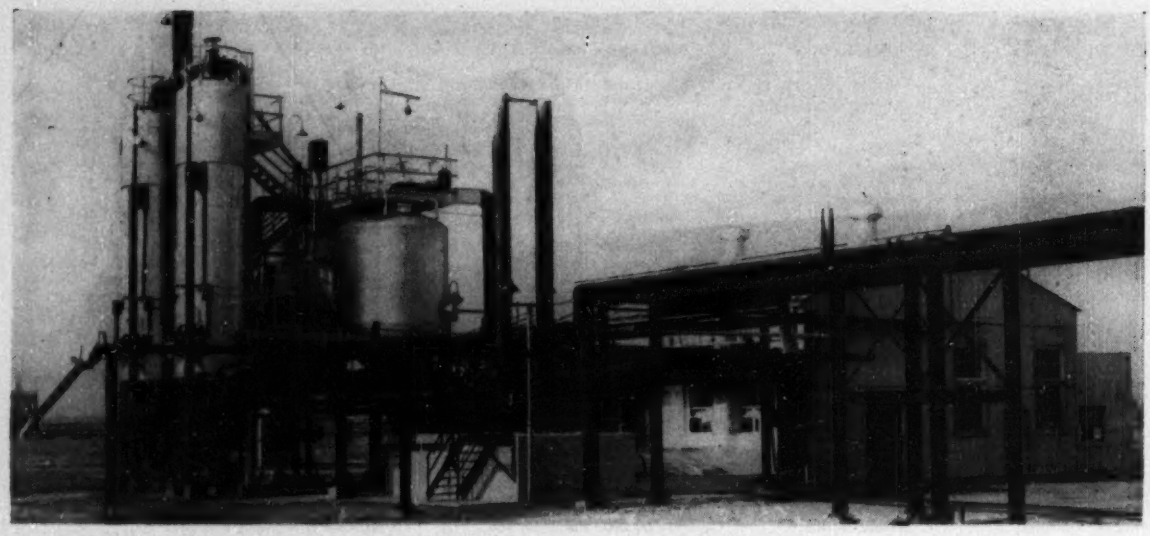
Sulphur and Sulphuric (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Cornwell Chemical	Cornwells Heights, Pa	481,000	Sulphuric acid	Certificate of necessity awarded.
Eagle-Picher	Galena, Kan	4,000,000	Sulphuric acid	Contract awarded. Under construction. Will make about 240 tons acid/day. Also new zinc roasting unit. To be completed early 1954.
Esso Standard Oil	Linden N.J.	1,550,000	Sulphur	Certificate of necessity awarded
Freeport Sulphur	Bay Ste. Elaine, La	13,825,000	Sulphur	Certificate of necessity awarded. New Frasch plant starting up. Capacity: 100 M. long tons/yr.
Freeport Sulphur	Fort Bend Co., Tex		Sulphur	Planned. Develop new small dome.
Freeport Sulphur	Garden Island Bay, La		Sulphur	New Frasch plant to start up all 1953. Capacity: 500 M. long tons/yr.
Freeport Sulphur	Needville, Tex	1,750,000	Sulphur	Contract awarded. Sulphur mining plant.
Freeport Sulphur	New Orleans, La	14,250,000	Sulphur	Contract awarded. Sulphur mining plants at Garden Island Bay Dome and Bay Ste. Elaine Dome.
Garfield Chemical & Mfg	Garfield, Utah	2,500,000	Sulphuric acid	Contract awarded. Expanding 250 tons per/day.
General Petroleum	Manderson, Wyo	750,000	Sulphur	Proposed sulphur extraction plant.
Globe Oil & Refining	Lemont, Ill	183,000	Sulphur	Certificate of necessity awarded.
Gulf Oil	Philadelphia, Pa	1,100,000	Sulphur	Certificate of necessity awarded.
Gulf Oil	Port Arthur, Tex	1,750,000	Sulphuric acid	Contract awarded.
Gulf Oil	Waddell, Tex	685,000	Sulphur	Contract awarded 20 tons per/day. Recovery unit.
Humble Oil & Refining	Baytown, Tex	588,000	Sulphuric acid	Certificate of necessity awarded.
Imperial Acid	Farmington, N. M	474,000	Sulphur	Certificate of necessity awarded. Proposed recovery plant 60 tons per/day.
Jefferson Lake Sulphur	Cameron Parish, La		Sulphur	Began drilling Frasch process.
Minnesota Mining & Mfg	Copley Township, Minn	680,000	Sulphuric acid	Certificate of necessity awarded.
Monsanto/Tide Water Ass. Oil	Avon, Calif	2,050,000	Sulphuric acid	Certificate of necessity awarded. 250 tons per/day. Waste sludge & H_2S—raw materials. H_2SO_4 by Monsanto-Ross-Wilde process.
Monsanto Chemical	Monsanto, Ill	1,900,000	Sulphuric acid	Certificate of necessity awarded.
National Lead	St. Louis, Mo	957,000	Sulphuric acid	Certificate of necessity awarded.
Phillips Chemical	Crane, Tex	1,360,000	Sulphur	Additional sulphur recovery plant.
Phillips Chemical	Gaines Co., Texas	240,000	Sulphur	Certificate of necessity awarded.
Phillips Chemical	Goldsmith, Tex	1,250,000	Sulphur	Begun operations. 120 tons per/day sulphur from natural gas.
Phillips Chemical	Odessa, Tex	1,741,000	Sulphur	Proposed.
Phillips Chemical	Seminole, Tex	255,000	Sulphur	Contract awarded. Sulphur extraction plant.
Pure Oil	Toledo, Ohio	2,511,000	Sulphuric acid	Certificate of necessity awarded.
Seaboard Oil of Delaware	Park County, Wyo	905,000	Sulphur	Certificate of necessity awarded.
Shell Chemical	Houston, Tex		Sulphur	On stream, will recover 55 tons/day from H_2S gases from refinery.
Sid Richardson Petroleum	Winkler City, Tex	177,000	Sulphur	Certificate of necessity awarded.
Simpson Creek Collieries	Baltimore, Md	433,000	Sulphur	Certificate of necessity awarded.
Sinclair Refining	Marcus Hook, Pa		Sulphur	Completed. 21 tons/day from refinery gases.
Standard Oil of Indiana	Whiting, Ind		Sulphur	New plant on stream. Capacity: 55 tons sulphur per day from hydrogen sulphide in by-product gases.
Stanolind Oil & Gas	Hockley County, Tex	460,000	Sulphur	Certificate of necessity awarded.
Stanolind Oil & Gas	North Cowden, Tex	202,000	Sulphur	Certificate of necessity awarded. Planned from H_2S. 18 long tons/day.
Stanolind Oil & Gas	Odessa, Tex	1,250,000	Sulphur and recovery plant	Now on stream. To recover 48 long tons daily from H_2S-containing gases.
Stauffer Chemical	Compton, Calif	250,000	Sulphuric acid	Certificate of necessity awarded.
Stauffer Chemical	Hammond, Ind	117,435	Sulphuric acid	Certificate of necessity awarded.
Stauffer Chemical	Tuscola, Ill		Sulphuric acid	In operation soon.
Stauffer Chemical	Vernon, Los Angeles, Cal	1,000,000	Sulphuric acid	Certificate of necessity awarded.
Sullivan Mining	Kellogg, Idaho	5,300,000	Sulphuric	Construction started on converter to use zinc smelter stack gases. To be completed—Jan. 1954. Capacity: 250–300 tons acid/day.
Tennessee Copper	Copperhill, Tenn	2,944,000	Sulphuric acid	Certificate of necessity awarded.
Texas Gulf Sulphuric	Liberty, Tex	1,750,000	Sulphur	Contract awarded. Sulphur mining plant.
Texas Gulf Sulphur	Spindletop, Tex		Virgin sulphur	Begun mining. Est. 200,000 tons/yr.
Union Oil of Calif	Wilmington, Calif	1,200,000	Sulphur, ammonium sulphate, fuel oil	Certificate of necessity awarded.
Vermont Copper	South Strafford, Vt	75,000	Pyrrhotite sulphur	Certificate of necessity awarded.

SYNTHETIC FIBERS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Allied Chemical & Dye (National Aniline Div.)	Hopewell, Va	23,000,000	Nylon-type synthetic fiber.	$23 million plant to make nylon-type fiber (nylon 6 based on caprolactam. Raw materials: phenol) ammonia, hydrogen, sulphuric acid. Planned output: 20,000,000 lb./yr. of staple and continuous filament yarn and some plastic molding material. Production to get under way in about 2 yrs.
Carborundum	Falconer, N. Y		Ceramic fiber	Planned commercial plant with cap. of 45–50 tons fiber daily. Probably get under way in early 1954. Product known as Fiberfrax.
Celanese	Rock Hill, S. C	20,000,000	Cellulose acetate and staple fiber	Expansion which had been suspended now resumed.
Chemstrand	Decatur, Ala		Acrylic fiber	Will be on full stream in early 1953. Capacity: 30,000,000 lb./yr. Acrilan is chiefly acrylonitrile.
Chemstrand	Pensacola, Fla		Nylon	Under construction. Integrated nylon facilities. To produce chemical intermediate fiber and fiber products. Capacity: 50,000,000 lb. per yr. of nylon filament yarn. Full production by early 1954.
Du Pont	Martinsville, Va	13,764,000	Nylon yarn	Certificate of necessity awarded.
Du Pont	Seaford, Dela	6,453,000	Nylon yarn	Certificate of necessity awarded.
Ferro	Nashville, Tenn	1,000,000	Glass fiber	Announced plant; fiber glass for plastic reinforcement.
Industrial Rayon	Painesville, Ohio		Tire-rayon	Adding facilities. Complete end 1953. This and Cleveland expansion to cost $15 million.
Industrial Rayon	Cleveland, Ohio		Tire-rayon	Adding facilities. Complete by end 1953. With Painesville—$15 million.
Pittsburgh Plate Glass	Shelbyville, Ind		Glass fiber	To reach top production by early 1953.
Union Carbide	Spray, N. C	33,000,000	Dynel	Underway. 30 million lb./yr.

Synthetic Fibers (cont.).



SULPHUR FROM HYDROGEN SULPHIDE: Freeport Sulphur Co., Westville, N. J.

SYNTHETIC ORGANICS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Air Products	Walkerton, Ind	113,000	Acetylene	Certificate of necessity awarded.
Air Reduction	Calvert City, Ky	1,001,000	Acetylene	Certificate of necessity awarded.
Air Reduction	Louisville, Ky	82,000	Acetylene	Certificate of necessity awarded.
Allied Chemical & Dye (Semet-Solvay)	Chicago, Ill.	30,000,000	Phthalic anhydride	Contract awarded.
Allied Chemical & Dye	Hopewell, Va.	11,900,000	Methanol, formaldehyde.	Certificate of necessity awarded.
Allied Chemical & Dye (National Aniline Div.)	Moundsville, W. Va.	4,500,000	Maleic anhydride, fumaric acid	Certificate of necessity awarded. To begin construction.
Allied Chemical & Dye	Moundsville, W. Va.	2,500,000	Methylene chloride	Certificate of necessity awarded.
Allied Chemical & Dye (National Aniline Div.)	Moundsville, W. Va.	2,300,000	Nitrobensene, aniline	Proposed.
Allied Chemical & Dye (Semet-Solvay)	Orange, Tex.	5,000,000	Ethylene chemicals	Construction begun. Plant to make ethylene oxide and glycol, diethylene glycol, triethylene glycol. Completion date: early 1954.
Allied Chemical & Dye	Philadelphia, Pa.	818,000	Phthalate esters	Certificate of necessity awarded.
Allied Chemical & Dye	South Point, Ohio	4,200,000	Urea	To revamp present plant. To convert to recycle process.
American Aniline & Extract	Philadelphia, Pa.	84,000	Acrylic nylon size	Certificate of necessity awarded.
American Cyanamid	Avondale, La.	7,500,000	Urea	Certificate of necessity awarded. Chemico process.
American Cyanamid	Bound Brook, N. J.	500,000	Mononitrobensene	Certificate of necessity awarded.
American Cyanamid	Bridgeville, Pa.	6,165,000	Phthalic anhydride	Certificate of necessity awarded.
American Cyanamid	New Orleans, La.	50,000,000	Acrylonitrile	Going ahead. $50 million plant to make ammonia, acetylene, hydrogen cyanide, acrylonitrile and ammonium sulphate.
American Cyanamid	Willow Island, W. Va.	3,089,000	Melamine	Certificate of necessity awarded. Expanded facilities.
American Petrochemical	Lake Charles, La.	26,640,000	Vinyl, ethyl chloride	Certificate of necessity awarded. Construction underway.
Archer-Daniels-Midland	Buffalo, N. Y.		Solvents	Construction begun. Solvent extraction plant.
Arizona Chemical	Panama City, Fla.	635,000	Pinene products	Certificate of necessity awarded. For alpha and beta pinenes.
Arnold, Hoffman & Co	Cincinnati, Ohio		Synthetic products from fatty acids	Installed new molecular still and new esterification unit. Products: distilled esters, distilled oleic acid, softeners, wetting agents.
B. F. Goodrich Chemical	Avon Lake, Ohio		Beta—alanine	In commercial production. Uses simpler, one-stage process.
B. F. Goodrich Chemical			Sodium polyacrylates	Expanded plant facilities.
Bonewitz Laboratories	Burlington, Iowa		Phenyl sulphonates	New facilities almost completed.
Borden	Demopolis, Ala.	1,028,000	Formaldehyde	Certificate of necessity awarded.
Calhio Chemicals	Lake County, Ohio	800,000	n-trichloromethyl-thio-tetrahydrophthalimide	Certificate of necessity awarded.
Cities Service			Urea	Returned certificate of necessity for urea plant.
Columbia Southern	Barberton, Ohio	243,000	Perchlorethylene	Certificate of necessity awarded.
Colton Chemical	Cleveland, Ohio		Polyvinyl alcohol	New plant on stream.
Columbia Southern	Louisville, Ky.	3,070,000	Perchlorethylene	Certificate of necessity awarded.
Commercial Solvents	Agnew, Calif.	450,000	Formaldehyde	Certificate of necessity awarded.
Commercial Solvents	Peoria, Ill.	385,000	Formaldehyde	Certificate of necessity awarded.
Commercial Solvents	Seattle, Wash.	724,000	Formaldehyde	Certificate of necessity awarded.
Commercial Solvents	Sterlington, La.	4,337,000	Methylamines	Certificate of necessity awarded.
Dewey & Almy	Acton, Mass.	476,000	Maleic anhydride	Certificate of necessity awarded.
Dewey & Almy	Acton, Mass.	440,000	Refined isoprene	Certificate of necessity awarded.
Dextran Corp.	Yonkers, N. Y.		Dextran	Entering production.
Diamond Alkali	Deer Park, Tex.	750,000	Perchlorethylene	Certificate of necessity awarded.

Synthetic Organics (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Diamond Alkali	Houston, Tex	1,119,000	Methylene chloride	Certificate of necessity awarded.
Diamond Alkali	Painesville, Ohio	1,811,000	Perchlorethylene chemicals	Certificate of necessity awarded.
Diamond Alkali	Painesville, Ohio	1,300,000	Carbon tetrachloride	Certificate of necessity awarded.
Dow Chemical	Freeport, Tex	8,500,000	Ethylene dibromide	Planned. New plant.
Dow Chemical	Freeport, Tex	1,100,000	Benzene	Certificate of necessity awarded.
Dow Chemical	Freeport, Tex	6,675,000	Ethylene	Certificate of necessity awarded. Plans announced.
Dow Chemical	Freeport, Tex	3,480,000	Butadiene	Certificate of necessity awarded.
Dow Chemical	Freeport, Tex	9,400,000	Styrene	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	135,000	Aniline	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	136,000	Butadiene	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	1,948,000	Ethylene dibromide	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	2,675,000	Plasticizers	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	1,034,000	Salicylic acid	Certificate of necessity awarded.
Dow Chemical	Midland, Mich	3,250,000	Styrene	Certificate of necessity awarded.
Dow Chemical	Pittsburg, Calif	1,500,000	Methionine	Certificate of necessity awarded.
Dow Chemical	Torrance, Calif	1,723,000	Styrene	Certificate of necessity awarded.
Du Pont	Belle, W. Va	1,630,000	Adipic acid, hexamethylene diamine	Certificate of necessity awarded.
Du Pont	Gibbstown, N. J	311,000	Diphenylamine, aniline	Certificate of necessity awarded.
Du Pont	Spruance Plant, Richmond, Va.	.....	Cellophane	To expand and improve plant. Project to start in Spring 1953 and finish late in 1954.
Du Pont	Victoria, Tex	33,475,000	Adiponitrile	Certificate of necessity awarded.
Dye Oxygen	Phoenix, Ariz	18,000	Acetylene	Certificate of necessity awarded.
Eastman Kodak	Kodak Park, N. Y	.....	Photographic developer	New plant nearing completion for making monomethyl-para-aminophenol sulphate.
Eastern States Chemical	Houston, Tex	554,000	Benzene	Certificate of necessity awarded.
Eastern States Petroleum	Houston, Tex	4,000,000	Ethylene	Planned.
Eastern States Petroleum	Houston, Tex	3,300,000	Aromatics	In operation. 200 bbl./day benzene. Lesser amount of toluene.
Emery Industries	Cincinnati, Ohio	2,000,000	Azelaic acid, pelargonic acid	Plant to go on stream by mid-1953. Uses new ozone oxidation process with oleic as raw material.
Ethyl Corp	Baton Rouge, La	4,155,000	Antiknock compounds	Certificate of necessity awarded.
Fine Organics	Lodi, N. J	26,000	Phenylephrine	Certificate of necessity awarded.
Firestone Tire & Rubber	Pottstown, Pa	961,500	Butadiene, butylene	Certificate of necessity awarded.
Food Mach. & Chem (Ohio-Apex Div.)	Nitro, W. Va	.....	Tributyl phosphate	Begun production.
Foster Grant Co	Orange, Tex	4,766,000	Styrene monomer	Certificate of necessity awarded. Ground broken.
Gamma Chemical	Great Meadows, N. J	75,000	Hydroxyquinoline	Certificate of necessity awarded.
General Aniline & Film	Linden, N. J	850,000	Carbonyl iron powders	Certificate of necessity awarded.
General Aniline & Film	.....	1,509,000	Photo film chemicals	Certificate of necessity awarded.
Glyco Products	Williamsport, Pa	.....	Monoglycerides	Operating new plant.
Goodyear Tire & Rubber	Akron, Ohio	1,762,000	Styrene	Certificate of necessity awarded.
Great Southern Chemical	Corpus Christi, Tex	2,902,000	Benzene, toluene	Contract awarded.
Gulf Oil	Port Arthur, Tex	586,000	Ethylene	Certificate of necessity awarded.
Halocarbon Products	North Bergen, N. J	50,000	Polytrifluorochloroethylene, oils, greases, waxes	RFC loan obtained.
Hercules Powder	Delaware River area	.....	Phenol	Complete 1953. From cumene. Adds coal tar products to Hercules traditional line of cellulose and naval stores derivatives, acetone byproduct.
Hercules Powder	Gibbstown, N. J	8,000,000	Hydrocarbon chemicals	Certificate of necessity awarded.
Hercules Powder	Hopewell, Va	316,000	Ethyl cellulose	Certificate of necessity awarded.
Hercules Powder	Mansfield, Mass	2,380,000	Formaldehyde	Certificate of necessity awarded.
Hercules Powder	Paulsboro, N. J	8,500,000	Phenol	Certificate of necessity awarded.
Hercules Powder	Hattiesburg, Miss	527,000	Camphene	Certificate of necessity awarded.
Hercules Powder	Parlin, N. J	4,000,000	Chemicals, cellulose acetates flake, cellulose acetate molding powder	Certificate of necessity awarded.
Hayden Chemical	Fords, N. J	399,000	Hexamine	Certificate of necessity awarded.
Heyden Chemical	Fords, N. J	280,000	Formaldehyde	Certificate of necessity awarded.
Heyden Chemical	Garfield, N. J	1,207,000	Pentaerythritol	Certificate of necessity awarded.
Heyden Chemical	Garfield, N. J	398,000	Resorcinol	Certificate of necessity awarded.
Heyden Chemical	Pasadena, Tex	12,000,000	Methanol, etc	Contract awarded.
Hooker Electrochemical	Niagara Falls, N. Y	450,500	Trichlorobenzene	Certificate of necessity awarded.
International Minerals & Chem.	San Jose, Calif	3,000,000	Monosodium glutamate	Now spending $1.5 million, will add another $1.8 million for additional expansion. Will boost capacity by 2/3rds to 6.6 million lb./yr.
Jefferson Chemical	Port Neches, Tex	18,700,000	Ethylene oxide	Certificate of necessity awarded.
Jefferson Chemical	Port Neches, Tex	.....	Ethanolamines	On stream.
Jefferson Chemical	Port Neches, Tex	280,000	Nonyl phenol	Certificate of necessity awarded.
Jefferson Chemical	Port Neches, Tex	1,625,000	Glycol and other	$850,000 for glycol; $400,000 and $375,000 for unspecified chemical units. Contract awarded.
J. T. Baker Chemical	Phillipsburg, N. J	.....	Dextran	Building.
Koppers	Kobuta, Pa	4,000,000	Phthalic anhydride	Certificate of necessity awarded.
Koppers	Port Arthur, Tex	.....	Ethyl benzene	Ready to go into operation.
Mathieson	Doe Run, Ky	.....	Ethylene oxide, glycol, LPG	Ethylene glycol and oxide inching toward capacity. LPG on stream for several mos.
Mathieson	Lake Charles, La	2,150,000	Hydrazine	Start construction at once.
Monsanto	Addyston, Ohio	3,673,000	Styrene	Certificate of necessity awarded.
Monsanto	Anniston, Ala	571,000	Biphenyl, aroclor	Certificate of necessity awarded.
Monsanto	Anniston, Ala	211,000	Tolylene diisocyanate	Certificate of necessity awarded.
Monsanto	Avon, Calif	.....	Phenol	Construction started. To operate in early 1954. To use new process.
Monsanto	Everett, Mass	2,208,000	Phthalate esters	Certificate of necessity awarded.
Monsanto	Long Beach, Calif	133,000	Styrene	Certificate of necessity awarded.
Monsanto	Monsanto, Ill	540,000	Hydrogenated products	Certificate of necessity awarded.
Monsanto	Monsanto, Ill	290,000	Parachlorphenol	Certificate of necessity awarded.
Monsanto	Springfield, Mass	669,000	Formaldehyde solutions	Certificate of necessity awarded.
Monsanto	Springfield, Mass	245,000	Styrene	Certificate of necessity awarded.
Monsanto	St. Louis, Mo	263,000	Benzoic acid	Certificate of necessity awarded.
Monsanto	St. Louis, Mo	310,000	Phthalyl chloride	Certificate of necessity awarded.
Monsanto	St. Louis, Mo	780,000	Tricresyl phosphate	Certificate of necessity awarded.
Monsanto	Texas City, Tex	3,500,000	Styrene	Addition to styrene monomer plant.

Synthetic Organics (cont.)

ACRILAN: Chemstrand Corp., Decatur, Ala.

Synthetic Organics (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
National Aniline	Moundsville, W. Va	2,300,000	Aniline and nitrobenzene	Hopes to complete plant early in 1953. Newly-developed, continuous catalytic process.
Ninol Laboratories	Chicago, Ill		Hydrocarbon sulfonates	Announced that new process will be used. New plant with capacity of 10,000,000 lbs./yr.
Norwich Pharmacal	Norwich, N. Y	140,000	Nitrofurans	Began operations early 1953. Cost $140,000. Capacity: 240,000 lb. of furacin (one of the nitrofurans).
Olin Industries	Covington, Ind	20,000,000	Cellophane	Site purchased. Building plans announced.
Pacific Cheminal			Urea	Returned certificate of necessity for urea plant.
Pennsylvania Industrial Chem	Jefferson, Pa	3,807,000	Styrene	Certificate of necessity awarded.
Phillips Chemical	Pasadena, Tex		Methylvinyl pyridine	Production begun.
Phillips Chemical	Houston, Tex	2,500,000	Pyridene	Contract awarded.
Phillips Oil	Phillips, Tex	294,000	Propylene polymer (for alk. feed)	Certificate of necessity awarded.
Phillips Petroleum	Borger, Tex	1,556,000	Cyclohexane	Certificate of necessity awarded.
Phillips Petroleum	Phillips, Tex	517,000	Cyclohexane concentrate	Certificate of necessity awarded.
Phillips Petroleum	Phillips, Tex	144,000	Cyclohexane	Certificate of necessity awarded.
Phillips Petroleum	Sweeny, Tex	18,805,000	Aromatics	Proposed for aviation gas. Enlarge refinery.
Pittsburgh Coke & Chemical	Neville Island, Pa	225,000	2,4-D acid esters	Certificate of necessity awarded.
Pittsburgh Coke & Chemical	Neville Island, Pa		Plasticizers	Will expand present semi-works prod. to full oper. in June.
Publicker Industries	Eddington, Pa	4,309,000	Butadiene	Certificate of necessity awarded.
Pure Oil	Toledo, Ohio	2,560,000	Alkylate	To be constructed. Alkylation unit.
Quaker Oats	Memphis, Tenn	546,000	Furfuryl alcohol	Certificate of necessity awarded. Complete mid-1953. Plans to use a new continuous process hydrogenation.
Quimico	Contra Costa Co., Calif	1,217,000	Tetraethyl lead	Certificate of necessity awarded.
Reichhold	Houston, Texas	5,000,000	Phenol	Expansion.
Reichhold	Tuscaloosa, Ala	1,475,000	Phenol	Expansion.
Rohm & Haas	Bristol, Pa	1,263,000	Methyl methacrylate	Certificate of necessity awarded.
Rohm & Haas	Deer Park, Tex	13,371,000	Hydrogen cyanide; ethyl, methyl methacrylates	Certificate of necessity awarded.
Rohm & Haas	Philadelphia, Pa	435,000	Methylamines	Certificate of necessity awarded.
Salt Lake Refining	Salt Lake City, Utah	6,365,000	Cumene for phenol	Certificate of necessity awarded.
Shell Chemical	Houston, Tex	1,514,000	Synthetic glycerine	Expanding—50% boost.
Shell Chemical	Houston, Tex	1,442,000	Ethylene, propylene	Certificate of necessity awarded.
Shell Chemical	Houston, Tex	7,054,000	Ethyl chloride	Certificate of necessity awarded.
Shell Oil	Harris Co., Tex	2,720,000	Ethyl chloride	Certificate of necessity awarded.
Shell Oil	Wilmington, Calif	100,000	Benzene	Certificate of necessity awarded.
Sherwin-Williams	Chicago, Ill		Para-cresol	Completing 50% expansion.
Sid Richardson			Urea	Returned certificate of necessity for urea plant.
Sloss-Sheffield Steel	Birmingham, Ala	73,000	Benzene	Certificate of necessity awarded.
Southern Alkali (now Columbia Southern)	Louisville, Ky	3,070,000	Perchlorethylene	Certificate of necessity awarded.
Standard Oil (Ind.)	Texas City, Tex		Benzene	More benzene.
Standard Oil (Ind.)	Whiting, Ind		Benzene	More benzene.
Standard Oil (Ind.)	Wood River, Ill	2,552,000	Alcohols—octyl, nonyl, etc.	Planned.
Stauffer Chemical	Louisville, Ky	2,524,000	Carbon tetrachloride	Certificate of necessity awarded.
Stauffer Chemical	Le Moyne, Ala		Carbon bisulphide	Completed new plant.
Sun Oil	Marcus Hook, Pa	20,000,000	Aromatics	Contract awarded.
Tennessee Corp	Lockland, Ohio	500,000	Chlorosulfonic acid	Scheduled for completion, autumn 1952.
Texas Eastman	Longview, Tex		n-Isobutyraldehyde	On stream. Taking 1/3rd of eventual propane, and 2/5ths of nat. gas. Oxo process.
Union Carbide	Institute, W. Va	476,000	Ethyl acrylate, ammonium sulphate	Certificate of necessity awarded.
Union Carbide (Carbide & Carbon)	Institute, W. Va		Acrylonitrile	Expanding. Concurrent with new dynel staple plant at Spray, N. C.
Union Carbide & Carbon (Bakelite)	Marietta, Ohio		Phenol	New plant completed. Cap: 60,000,000 lbs./yr.

Synthetic Organics (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Union Carbide & Carbon	Seadrift, Tex	66,300,000	Ethylene oxide, polyethylene	Certificate of necessity awarded.
Union Carbide & Carbon	So. Charleston, W. Va	208,000	Butyl, ethyl, propanedial, ethylhexyl amine	Certificate of necessity awarded.
Union Carbide (Carbide & Carbon)	Texas City, Tex	893,000	Butadiene	Certificate of necessity awarded.
Union Oil of Calif.	Wilmington, Calif.	12,000,000	Benzene, toluene	Certificate of necessity awarded.
Universal Oil	Mooringsport, La.	594,000	Benzene, toluene compn.	Certificate of necessity awarded.
Wyandotte Chemicals	Wyandotte, Mich.	6,200,000	Ethylene oxide	Certificate of necessity awarded.

VEGETABLE OILS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Archer-Daniels-Midland	Los Angeles, Calif.		Bodied oils, chemically-modified oils	Expanding. Also a solvent extraction plant at Buffalo, N. Y.
Galesburg Soy Products	Galesburg, Ill.	500,000	Soybean oil	Loan from RFC to convert to solvent extraction.
Honeymeal Products	Mankato, Minn.		Soybean oil	Expansion announced. New Rotocel extractor for processing 500 tons/day of soybeans, doubles plant capacity.
Spencer Kellogg	El Centro, Calipatria, Long Beach, Calif.	1,000,000	Cottonseed oil	Planned.
Swift	Fostoria, Ohio		Soybean oil	Modernized and expanded facilities to process 200 tons of beans/day. To operate early 1953.
Wonder Rice Oil	Houston, Tex.	500,000	Rice-bran oil	Production started. Uses continuous solvent extraction. Daily capacity: 30,000 lb. of oil.

OTHERS

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Alcoa	Alcoa, Tenn.	204,000	Cryolite	Certificate of necessity awarded.
Allied Chemical & Dye (Semet-Solvay)	Syracuse, N. Y.		Ammonium bicarbonate	Scheduled to be in production.
Allied Chemical & Dye (General Chemical)	San Francisco, Calif.	2,500,000	Aluminum fluoride	Operating. 15,000 tons/yr.
Aluminum Ore	Bauxite, Ark.		Aluminum chemicals	Announced. Finished chemical products from alumina.
Aluminum Ore	East St. Louis, Ill.	750,000	Cryolite	Certificate of necessity awarded.
American Metallic Chemicals	Portland, Ore.	650,000	Manganese dioxide, sodium perborate	Planned. $575,000 for perborate; $75,000 to double facilities for manganese dioxide. Perborate to be made by electrolytic process based on Dutch methods. Plant to operate by Aug. 1953.
American Potash	Trona, Calif.		Crude borax pentahydrate	Product for supplying trace quantities of boron to soils.
Arnold Hoffman	Dighton, Mass.	315,000	Military chemicals	Certificate of necessity awarded.
Buffalo Electro-Chemical	Vancouver, Wash.		Hydrogen peroxide	Production begun.
Cabot Carbon (Cabot Min. Div.)	Willsboro, N. Y.		Wollastonite	Completing engineering for its 2nd mill.
Carborundum	Vancouver, Wash.	3,319,000		Plant addition.
Celanese Corp. of Amer.	Pampa, Tex.	2,800,000	Oxygenated natural gas	Under construction.
Ciba States	Toms River, N. J.	2,747,000	Military chemicals	Certificate of necessity awarded.
Columbia-Southern	Barberton, Ohio	3,963,000	Herbicide	Certificate of necessity awarded.
Columbia-Southern	New Martinsville, W. Va.	8,500,000		Additions.
Commercial Solvents	New York	13,195,000	Nitroparaffins	Certificate of necessity awarded.
Commercial Solvents	Terre Haute, Ind.	233,000	Tributyl phosphate	Certificate of necessity awarded.
Detrex	Wyandotte, Mich.	664,500	Alkali cleaners	Certificate of necessity awarded.
Diamond Alkali	Dallas, Tex.	392,000	Sodium silicate	Certificate of necessity awarded.
Diamond Alkali	Kearney, N. J.	118,000	Chromic acid	Certificate of necessity awarded.
Diamond Alkali	Painesville, Ohio	195,000	Chromic acid	Certificate of necessity awarded.
Diamond Alkali	Painesville, Ohio	12,000,000		Halted construction $12 million expansion.
Diamond Alkali	Painesville, Ohio	228,500	Chemicals	Certificate of necessity awarded.
Dow Chemical	Freeport, Tex.	7,024,000	Chemicals, magnesium, etc.—chloroform, hydrochloric acid	Certificate of necessity awarded.
Dow Chemical	Midland, Mich.	6,225,000	Chemicals	Certificate of necessity awarded.
Dow Chemical	Midland, Mich.	2,882,000	Brine	Certificate of necessity awarded.
Dow Chemical	Midland, Mich.	911,000	Bromine brine wells, bromine	Certificate of necessity awarded.
Du Pont	Charlestown, Ind.	8,966,000	Smokeless powder	Contract awarded. Rehabilitation.
Du Pont (Govt. contract)	Charlestown, Ind.		Propellent powders, ammunition, small arms	Contracted. Full production in July.
Du Pont	Martinsburg, W. Va.	Multimillion	Explosives	Contract awarded. Break ground in Feb. Complete in a year.
Du Pont	Deepwater Pt., N. J.	400,000	Chemicals	Certificate of necessity awarded.
Eastman Kodak	Rochester, N. Y.		Silver nitrate	Construction under way. Second unit to produce silver nitrate crystals by continuous process. Cap.: 5 tons/day.
Edwal Laboratories	Ringwood, Ill.	109,000	Metal, formaldehyde, bisulfite, chemicals	Certificate of necessity awarded.
Emery Industries	Cincinnati, Ohio	2,000,000		Addition to its chemical plant.
Fairmont Chemical	Newark, N. J.	146,000	Hydrazine	New unit on stream. To produce hydrazine base, hydrate, sulphate and other salts.
Foote Mineral	Exton, Pa.		Lithium hypochlorite	Pilot plant now producing at rate of 1.0 tons/mo.
Foote Mineral	Kings Mountain, N. C.		Lithium chemicals	Contracts being let—operating within a year. Full scale plant.
Glidden	Buena Park, Calif.		Chlorophyllin	Begun extraction of crude chlorophyllin from alfalfa. Can treat 50 tons alfalfa/day to get 400 lb./day of crude chlorophyllin.
Great Lakes Carbon			Diatomaceous earth	Contract let.
Gulf Naval Stores	Andalusio, Ala.	1,800,000	Naval stores	From pine stumps. Operating.
Hardesty Chemical	Dover, Ohio	539,000	Sebacic acid	Certificate of necessity awarded.
Hercules Powder	Hattiesburg, Miss.	533,000	Rosin amine	Certificate of necessity awarded.

Others (cont.)

PHTHALIC ANHYDRIDE: Reichhold Chemicals, Detroit, Mich.

Others (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Hoberg Paper Mills	Green Bay, Wis.	.....	Yeast	Will make 4,500 tons of yeast annually from waste sulphite pulp liquors.
Indiana Ordnance Works	Charlestown, Ind.	.....	Explosives	First 6 lines now in operation. Plant operated by Du Pont. Products: artillery propellant powders and small arms ammunition.
International Minerals & Chem. (Potash Div.)	Carlsbad, N. M.	2,500,000	HCl and magnesium oxide	Construction plans announced.
International Graphite & Electrode	Niagara Falls, N. Y.	11,000,000	Graphite electrodes	Reach full scale operations May 1953 from expanded facilities.
Interchemical	Chicago, Ill.	180,000	.....	Factory addition. Contract awarded.
Jefferson Chemical	Port Neches, Tex.	1,000,000	Metal phenolates	Certificate of necessity awarded.
Kaiser Aluminum & Chemical	Fallon, N. M.	411,000	Fluorspar	Certificate of necessity awarded.
Kaiser Aluminum & Chemical	Mead, Wash.	5,000,000	Aluminum byproducts	Work being completed fume disposal system on the 8 potlines in aluminum reduction plant. Recovers 35 tons/day of dust high in alumina and fluorine.
Kentucky Synthetic Rubber	Louisville, Ky.	1,300,000	.....	Contract awarded. Additions to plant.
Koppers	Oil City, Pa.	196,000	Aviation fuel antiexidant	Certificate of necessity awarded.
Lindsay Light & Chemical	W. Chicago, Ill.	1,800,000	Rare earth chemicals	Contract awarded.
Lithium Corp. of America	Hill City, S. D.	157,500	Spodumene concentrate	Certificate of necessity awarded.
Lubrizol	Deer Park, Tex.	1,649,000	Oil additives	Certificate of necessity awarded.
Lubrizol	Wickliffe, Ohio	769,000	Oil additives	Certificate of necessity awarded.
Magnet Cove Barium	New Orleans, La.	400,000	Barium sulphate	Certificate of necessity awarded.
Manganese Chemical	Riverton, Minn.	2,000,000	Manganese chemicals	DMPA agreement to build plant to treat 200 tons of ore daily by Dean process. Contract awarded.
Metalloy	St. Louis Park, Minn.	131,000	Lithium chemicals	Certificate of necessity awarded.
Michigan Chemical	Manistee, Mich.	361,000	Liquid bromine	Certificate of necessity awarded.
Midwest Carbide	Mayes Co., Okla.	2,027,000	Calcium carbide	Certificate of necessity awarded.
Minnichlor	Enfield, Minn.	.....	Chlorophyllin	New extraction plant begins production. Est. cap.: 70-80 lb./day.
Minnesota Min. & Mfg.	St. Paul, Minn.	6,368,000	Abrasive products	Certificate of necessity awarded.
Molybdenum Corp. of America	.....	549,000	Rare earth concentrates	Certificate of necessity awarded.
Monsanto	Anniston, Ala.	229,000	Military chemicals	Certificate of necessity awarded.
Monsanto	Monsanto, Ill.	3,254,000	Chemicals	Certificate of necessity awarded.
Monsanto	Muscle Shoals, Ala.	3,975,000	Calcium carbide	Certificate of necessity awarded.
Monsanto	Nitro, W. Va.	1,223,000	Chemicals	Certificate of necessity awarded.
Monsanto	Nitro, W. Va.	1,780,000	Chemicals	Certificate of necessity awarded.
Monsanto	Nitro, W. Va.	592,000	Rubber cure comps.	Certificate of necessity awarded.
Monsanto	St. Louis, Mo.	315,000	Hydraulic fluids	Certificate of necessity awarded.
Monsanto	Seattle, Wash.	.....	Vanillin	On stream about Apr. 15. Semi-refining vanillin from waste sulphite liquor.
Monsanto	Texas City, Tex.	26,000,000	HCN, acrylonitrile	Operating. Over 30 million lb./yr.
National Chlorophyll & Chemical	Lamar, Colo.	1,000,000	Chlorophyll	Construction begun. Continuous extraction plant. New plant expected to turn out 100,000 lb./yr.
Monsanto	Monsanto, Ill.	1,646,000	Oil additives	Certificate of necessity awarded.
Monsanto	St. Louis, Mo.	1,900,000	Chemicals	Certificate of necessity awarded.
Morton-Withers Chemical	Texas	.....	Lube additives	Certificate of necessity awarded. Liquid petroleum sulfonates.
National Lead	Perth Amboy, N. J.	194,000	Antimony oxide	Certificate of necessity awarded.
Northwestern Refining	St. Paul Park, Minn.	2,000,000	Refining additives	Contract awarded.
Ohio-Apex	Nitro, W. Va.	182,000	Phosphorus oxychloride	Certificate of necessity awarded.
Oldbury Electro-Chemical	Lowndes Co., Miss.	3,250,000	Sodium chlorate	Contract awarded.
Oronite Chemical	Oak Point, La.	554,000	Oil additives	Certificate of necessity awarded.
Ozark-Mahoning	Doming, Grant Co., N. M.	500,000	Fluorspar, acid grade	Certificate of necessity awarded.
Ozark-Mahoning	Jackson Co., Colo.	752,000	Fluorspar	Certificate of necessity awarded.
Pacific Carbide & Alloys	Portland, Ore.	91,500	Calcium carbide	Certificate of necessity awarded.
Pacific Coast Borax	Wilmington, Calif.	199,000	Boric acid	Certificate of necessity awarded.
Pennsalt	Calvert City, Ky.	1,452,000	Sodium chlorate	Certificate of necessity awarded.
Pennsalt	Natrona, Pa.	159,000	Kryolith	Certificate of necessity awarded.
Pennsalt	Natrona, Pa.	.....	Chlorine trifluoride	New facilities added to increase output.
Pennsalt	Portland, Ore.	702,000	Sodium chlorate	Certificate of necessity awarded.
Pennsylvania Industrial Chemical	Chester, Pa.	7,641,000	Chemicals	Certificate of necessity awarded.

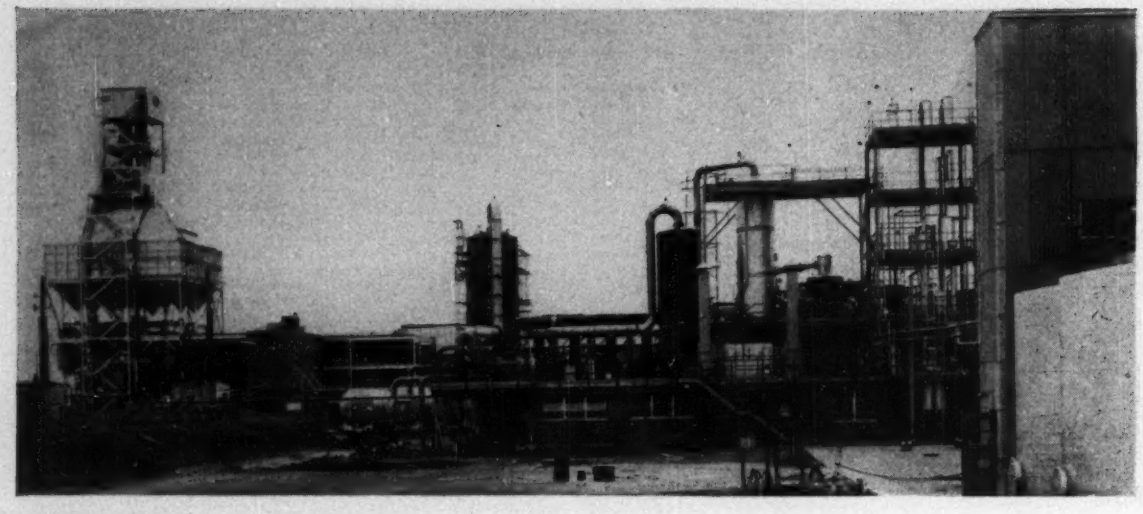
Others (cont.)

FIRM	LOCATION	DOLLARS	PRODUCT(S)	JOB STATUS AND REMARKS
Phillips Chemical	Moore Co., Texas	1,684,000	Nitric acid	Certificate of necessity awarded.
Quinn Drug & Chemical	Greenwood, Miss	150,000	Chemicals	Contract awarded. Plant addition.
Reichhold	Tuscaloosa, Ala	1,500,000		Proposed additions to plant.
Reynolds Mining	Poncha Springs, Colo	393,000	Fluorspar	Certificate of necessity awarded.
Rohm & Haas	Bristol, Pa	674,000	Hydraulic oil components	Certificate of necessity awarded.
Rohm & Haas	Philadelphia, Pa	239,000	Sebacic acid	Certificate of necessity awarded.
Sinclair Refining	Houston, Tex	146,000	Barium sulfonate	Certificate of necessity awarded.
Southern Alkali	Corpus Christi, Tex	350,000	Sodium tannate	Certificate of necessity awarded.
Stauffer Chemical	Louisville, Ky		HCl	Construction started May 1952.
Stauffer Chemical	Louisville, Ky	2,500,000	CCl_4	Contract awarded.
Stauffer Chemical	Tacoma, Wash	320,000	Chemicals	Planned. Plant addition.
Stauffer Chemical	Salco, Ala	1,000,000	CS_2	Plant underway.
Strong Cobb (American Chlorophyll)	Lake Worth, Fla		Chlorophyllin	Awarded contract for expansion of extraction facilities. Cap. of present plant est. at about 4,500 lb./mo.
Tennessee Corp		737,000	Manganese sulphate	Certificate of necessity awarded.
Union Carbide & Carbon (National Carbon Co.)	Columbia, Tenn	8,456,000	Graphite electrodes	Construction under way on plant addition to increase output of graphite electrodes by 35%. Completion scheduled for late 1953.
Union Carbide & Carbon	Niagara Falls, N. Y	1,208,000	Chemicals	Certificate of necessity awarded.
Virginia-Carolina Chemical	Nichols, Fla	474,000	Cryolite	Certificate of necessity awarded.
Vitro Chemical	Salt Lake City, Utah	838,000	Military products	Certificate of necessity awarded.
Western Electrochemical	Henderson, Nev	162,000	Manganese dioxide	Certificate of necessity awarded.

New Processes and Technology, 1951-52

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
FATS AND OILS					
Cottonseed oil	Solvent extraction			Isopropanol extracts oil from meats. Extract is refined by extraction with hexane.	Developed by Texas Eng. Exp. Sta Offered commercially May 1951.
Fats and oils	Cold rendering	W. Harris, Ltd	Toronto, Canada	Process renders oils and fats from bones, etc., suspended in water, by mechanical action of modified hammer mill.	Inventor, I. H. Chayen, British. Glues & Chemical Ltd., claims process is faster, gives better product, than present heat methods.
Fats and oils	Extraction	Swift & Co	Hammond, Ind	Liquid propane extraction at 465 psi. and 175 deg. F. removes color, metallic soaps, oxidized fats.	In use. Swift will license others.
Fatty acids		Cactus Chemical Co.	Houston, Texas	High purity fatty acids obtained from cactus.	Initial output 1,000 lb. per hr.
Fatty acids	Distillation			Two-stage continuous distillation removes light ends from unstable stocks, reduces discoloration.	Developed by Foster Wheeler Corp.
Glycerides	Hydrolysis			Hydrolysis of soybean oil with water at 500 psi. and 240 deg. C. separates glycerine and fatty acids. Re-combination produces mono-glycerides.	Developed by U. S. Dept. of Agriculture. Cost claimed competitive with conventional process.
Vegetable oils	Filtration-extraction			Suited to needs of small cottonseed processor. Uses conventional equipment.	Offered by Blaw-Knox.
Vegetable oils	Filtration-extraction			98% oil yield, high-grade meal. Small user can convert to solvent extraction without pre-pressing, rotary vacuum filter is main unit.	Developed by USDA. Offered by Lukens Steel Co.
Vegetable oils	Solvent extraction			Extractor consists of chain conveyor in a looped tube.	Developed by Iowa Engineering Exp. Sta. Demonstrated in 15 T/-day plant.
TEXTILE FIBERS					
Acrylonitrile	Dyeing of fibers	Carbide & Carbon Chemicals Div.	So. Charleston, W. Va.	Uses copper sulphate with a reducing agent.	
Dacron	Polymerization	E. I. duPont de Nemours & Co.	Kinston, N. C	Condensation product of dimethyl terephthalate and ethylene glycol.	Plant under construction by Du Pont. Licensed from Calico Printers Assn. Ltd.
Glass fibers	Sizing			Vinylchlorosilane sizing of fibers improves bonding of plastics to the glass.	Developed by Bjorksten Research Lab.
Glass fibers	Dyeing of fibers	Various		Fibers retain fire resistance.	Owens-Corning Co. has produced dyed fibers for evaluation.

Textile Fibers (cont.)



ACRYLIC FIBER: Chemstrand Corp.'s new plant at Decatur, Ala.

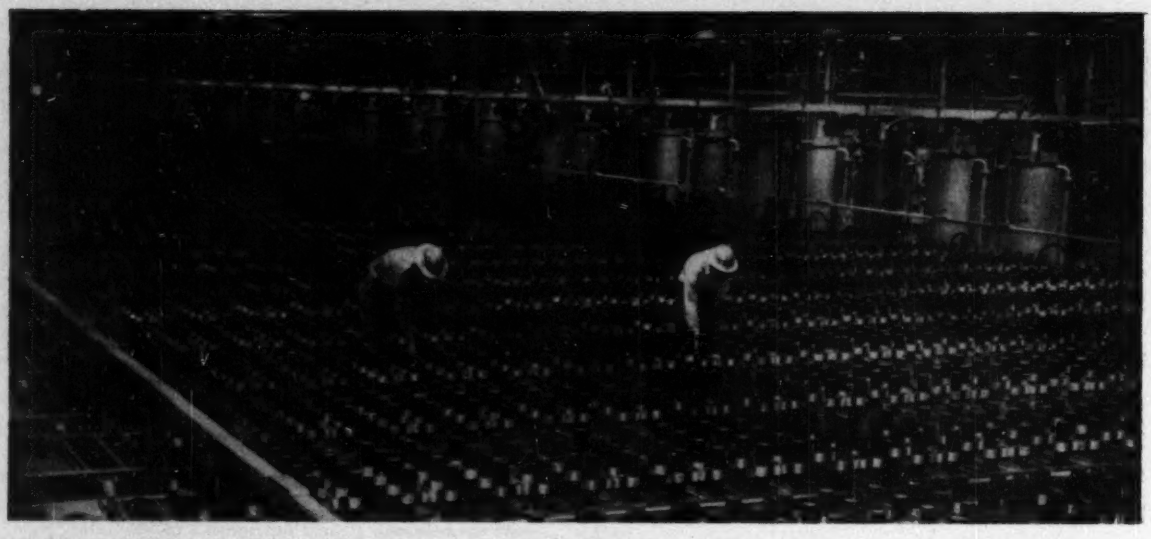
PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Textile Fibers (cont.)					
Mineral fabric, non-woven	Felting	.....	.....	Alumina-silica fibers 1x25 microns are felted on Fourdrinier machine.	Developed by Naval Research Lab.
Nylon	Helanca	Duplan Corp.	.....	Fibers are twisted and heat set to give stretch five times normal length.	Patented Swiss process.
Plastic fabrics	Fusion	.....	.....	Plastics such as Kel-F, nylon, Dacron, polyethylene are melted, sprayed with hot gas onto moving screen, later stripped as non-woven fabric of sub-micron filaments.	Developed for Naval Research Lab. for electrical fabrics, possibly protective clothing. Expect operating costs to be few cents per pound.
Polyamide fiber	.....	National Aniline Div., Allied Chemical & Dye Corp.	Hopewell, Va.	National will make 20 million lb./yr. of a nylon-type fiber based on caprolactam. This raw material is made from phenol, ammonia, hydrogen, sulphuric.	Process to be ready about end of 1954.

FERTILIZER CHEMICALS AND FERTILIZERS

Ammonia	Synthesis	Pennsylvania Salt Mfg. Co.	Wyandotte, Mich.	Combines hydrogen from electrolytic chlorine with nitrogen from air.	Casale process, developed in Italy.
Ammonia	Oxidation	Spencer Chemical Co.	Vicksburg, Miss.	Synthesis by partial oxidation of natural gas, cost reduced 6 percent.	First commercial plant, ready June 1953.
Ammonium nitrate	Continuous	Commercial Solvents Corp.	Sterlington, La.	Continuous reaction of ammonia and nitric acid at high temperature in small reactor reduces explosion risk.	Plant is smaller, costs less, has lower operating cost, permits product particle size control. Called Stengel process. Plant being built.
Ammonium nitrate	Prilling	Spencer Chemical Co.	Pittsburg, Kan.	Improved prilling with rising air gives better uniformity of particles.	Process in use.
Ammonium sulphate	Waste recovery	General Petroleum Corp.	Torrance, Calif.	Uses ammonia-containing cracking gas, plus sludge acid, both wastes.	New unit for 11 T/day in operation.
Ammonium sulphate	Double decomposition	Gov't. of India	Sindri, India	Ammonia from coal plus CO_2 and gypsum make 1,000 T/day of sulphate.	ICI process, built by Chemical Construction Corp.
Ammonium sulphate	Spray	.....	.....	Spray sulphuric acid and liquid coolant into gaseous ammonia to get dry product.	Developed by Socony Vacuum Oil Co.
Calcium metaphosphate	Fines-lump process	Tennessee Valley Authority	Wilson Dam, Ala.	Improved furnace treats phosphate fines as well as lumps with P_2O_5.	Demonstration 115 T/day furnace in operation.
Fertilizer, complete	Nitric acidulation	Nitrogen Division, Allied Chemical & Dye Corp.	South Point, Ohio	Ground phosphate continuously acidulated with nitric and a little sulphuric, then neutralized with ammonia. Potash salts are added and product is granulated.	Process expected to save up to 88,000 tons of sulphuric/year; product, containing 36 percent plant foods, will contain NPK.
Fertilizer, phosphate	Continuous	Stauffer Chemical Co.	.....	Produces pelleted material, eliminates aging, uses standard raw materials.	Developed in Italy. Commercial plant planned but time and place have not been announced.
Phosphoric acid	Evaporation	Gates Bros., Inc.	Wendell, Idaho	First submerged combustion for concentrating H_3PO_4. 90 percent fuel efficiency in concentrating wet process acid.	Developed by Chemical Construction Corp., built by Gates.
Phosphorus	Electric furnace	Tennessee Valley Authority	Wilson Dam, Ala.	Rotating crucible electric furnace gives smoother operation, less wear.	In use.
Superphosphate	Fusion	.....	.....	Phosphate rock fused with magnesium and potassium sulphates gives better than 95 percent P_2O_5 availability.	Pilot plant at Iowa State College.
Superphosphate	Nitric acidulation	Several	.....	TVA developed nitric acidulation process for phosphate fertilizers now to be used in at least three commercial plants.	TVA claims process is inherently more economical than sulphuric acidulation. Main advantage is saving of scarce sulphuric.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Fertilizer Chemicals and Fertilizers (cont.)					
Superphosphate, ammoniated	"Surfactant"	Illinois Farm Supply Co.	E. St. Louis, Ill.	Ammoniation aging step speeded up 10 times by mixing 0.05 per cent of surface-active agent Santomerse 1 with super and ammoniating agent.	Process available to industry, costs about 15c. per ton treated. Improves flow and storage qualities of fertilizer.
Superphosphate, ammoniated	Ammoniation			Addition of metallic compounds doubles amount of ammonia fixed per unit of P_2O_5.	French development.
INORGANICS					
Aluminum silicate fiber	Electric furnace	Carborundum Co.	Niagara Falls, N. Y.	50–50 silica-alumina melt in arc-resistance furnace at 3,300 deg. F. is blown by high-velocity air.	Fluffy, fibrous mass resists temperatures to 2,300 deg. F. Used also for electrical insulation and filtering. Called Fiberfrax.
Anodizing solution	Regeneration			Solutions regenerated with ion exchange resins.	Commercial installation of fall 1951 shows large savings. Developed by Permutit Co.
Bauxite ore	Beneficiation			Makes high-iron fraction of domestic ore usable for alumina production.	Developed by U. S. Bureau of Mines.
Calcium carbide	Electrothermic	National Carbide Co.	Calvert City, Ky.	Two 24,000 kw. carbide furnaces using rotating hearths to be installed. Slow rotation, 50–100 hr. per rev., counteracts crater formation, keeps charge porous.	Designed by Elektrokemisk A. S. of Oslo.
Carbon disulphide	Electrothermal	J. T. Baker	Penn Yan, N. Y.	Process uses sulphur and charcoal.	First commercial plant using process
Caustic-chlorine	Electrolytic	Monsanto Chemical Co. (for Army)	Muscle Shoals, Ala.	De Nora electrolytic cell has mercury cathode which serves to remove sodium as amalgam.	First plant started operation May, 1952.
Caustic-chlorine	Electrolytic			New four-layer mercury cell features novel space-saving construction, saving estimated 75 percent of floor area. Expected to cut voltage losses, resulting in less than 3,100 kwh. per ton chlorine in 30,000-amp. cell.	Mercury requirements reduced to 1,600–1,800 lb. per daily ton of chlorine. Developed by A. S. White, Chicago.
Caustic soda	Electrolytic recovery	Ashland Oil & Refining Co.	Ashland, Ky.	Spent caustic from gasoline sweetening, containing mercaptans, is regenerated by nascent oxygen at low cost in special electrolytic cells of plate type. Reduces capital and operating costs compared with conventional steam process.	Saves about $29 in operating cost and tetraethyl lead per M gal. gasoline. Developed by American Development Co., New York.
Ceramic aggregate, light-weight	High-temperature spherulising	Kanium Corp.	Chicago, Ill.	Vertical down-fired furnace operated on city gas at 2,700 deg. F. produces tiny hollow ceramic bubbles from clay introduced with combustion air.	Process developed by Armour Research Foundation makes lightweight ceramic aggregate by expansion, spherulising of suitable clays.
Ceramic coating	Fusion	Solar Aircraft Co.	San Diego, Calif.	Process applies ceramic coatings to jet engine parts, permits use of leaner alloys, saves nickel.	Facility now under construction.
Ceramic papers	Conventional			Papers made from fused quartz and ceramic fibers by conventional beating and paper machine withstand temperatures to 3,000 deg. F.	Developed by Naval Research Lab. Made from plentiful domestic materials. Suitable for high-temp electrical insulation, including nuclear power.
Chlorine	Indirect oxidation of HCl	Hercules Powder Co.	Brunswick, Ga.	HCl and ferric oxide form ferric chloride, then are oxidized with air to chlorine and ferric oxide. HCl is byproduct of toxaphene manufacture.	Dow proved in pilot plant at Pittsburg, Cal. Hercules proposes a 35 T/day plant. Process licensed from Dow and Grosvenor Labs.
Chlorine	Nitrosyl chloride modification	Solvay Process Div.	Hopewell, Va.	Gets more Cl_2 from present salt-nitric process by oxidising byproduct NOCl to release Cl_2, regenerate HNO_3.	Proposed.
Chlorine	Electrolytic, from HCl			From HCl via electrolysis of $CuCl_2$ in 4,000-amp. cell.	Developed by Westvaco Div.; 35 T/day plant has been designed.
Concrete	Compounding			Incorporation of polyvinylacetate triples tensile strength.	MIT development.
Cracking catalyst, microspheroidal	Slag process	Bay Chemical Co.	Weeks, La.	From steel mill slag by HCl treatment to adjust alumina-silica ratio.	Plant construction announced early in 1951.
Cracking catalyst, microspheroidal	Spray-dry	Davison Chemical Corp.	Cincinnati, Ohio	Made from sod. silicate, alum. sulphate, acid and ammonia. Reduces process time greatly.	New plant operating early in 1951.
Dicalcium phosphate	Acid extraction	Texas City Chemicals, Inc.	Texas City, Tex.	Process uses spent rather than concentrated sulphuric. Will treat phosphate rock with weak acid, recover uranium, neutralize with lime.	Weak acid will be supplied by Carbide & Carbon. Process developed by Chemical Construction. Plant ready Aug. 1953.
Enamel coating	Continuous furnace	Barrows Porcelain Enamel Co.	Cincinnati, Ohio	Dried enamel slip is continuously fused on pipe without handling marks.	Production is 1,800 ft. of pipe per shift.
Glass paper	Conventional	Several considering		Glass fibers mixed in beater with 99 percent water are sheeted on conventional paper machine. Adding suitable binders to increase strength is eventual aim.	Developed by National Bureau of Standards and Naval Research Lab. for air filters and electrical insulation.
Hydrazine	Electrolytic			Electrolytic process uses high-frequency current on ammonia, getting 4–6 grams water-free hydrazine directly per kwh., bypassing hydrazine hydrate.	Process only bench scale so far. Developed at University of Utah.
Hydrogen peroxide		E. I. duPont de Nemours & Co.	Memphis, Tenn.	New process based on 6 yr. research.	Plant was scheduled for end of 1952.
Light-weight aggregate	Hot expansion			Slag from electric phosphorus furnace is expanded while hot into a spongy mass, then cooled and crushed.	Developed by TVA, being tested commercially.

Inorganics (cont.)

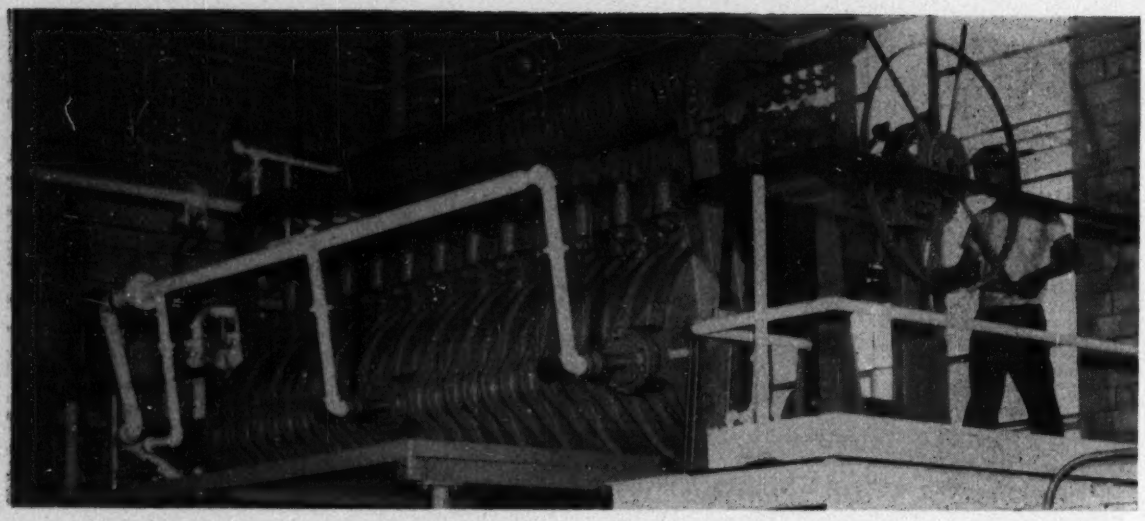


CAUSTIC-CHLORINE: DeNora cells at U. S. Army plant, Muscle Shoals, Ala.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Inorganics (cont.)					
Magnesium oxide...	Byproduct.....	International Minerals & Chemical Corp.	Carlsbad, N. M..	Waste liquors from potassium sulphate production will be processed to produce various magnesium oxides and HCl.	Plant will be integrated with Carlsbad Refinery, probably by July 1953.
Manganese dioxide..	Chemical refining..	Utah Construction Co. & Associates	Utah (projected)	Ore concentrate leached with sulphur dioxide, then oxidized at high temperature and pressure. Manganous sulphate is sintered to produce oxide, drive off SO_2.	Developed by Chemical Construction Corp. (See Cobalt). Independent tests show 90–95 percent recovery.
Mica.....	Sheeting.....	General Electric Co., others	Coshocton, Ohio..	Domestic mica flakes are treated to be self-bonding for continuous sheet formation via paper-making techniques.	Commercial production early 1952. Also Samica Corp., Integrated Mica, with processes varying in certain respects.
Nitric acid.....	Bamag-Meguin....	.....	.....	Oxidizes NH_3 with O_2 to produce 90–98 percent acid without dehydration by H_2SO_4.	Variation of Fauser process devel. in Germany. Is offered by Genl. Industrial Development Co.
Nitric acid.....	Thermal fixation..	Army Ordnance..	Sunflower Plant Lawrence, Kan.	High-temp. Food Machinery-Wisconsin process fixes N_2 as NO_2 at 4,200 deg. F., + H_2O → HNO_3.	First such plant being built, completion expected early 1953.
Ore beneficiation...	Electrostatic (?)...	International Minerals & Chemical Corp.	Florida (pilot plant); Carlsbad, N. M.	Ore is ground, dried, treated simply (how?), passed between separating electrodes. Can be used on potash ores, phosphate, others.	In pilot plant on Carlsbad, N. M., potash ores. Called LeBaron-Lawver process. Patents not yet issued. Larger plant scheduled for Carlsbad.
Oxygen.....	Fractionation.....	U. S. Navy.....	Aboard carriers...	Liquid air fractionation column has baffles to reduce effect of motion.	Meets oxygen demands for jet pilots.
Ozone.....	Electric discharge..	Emery Industries, Inc.	Cincinnati, Ohio.	New discharge process is 10 percent efficient.	Welsbach Corp. and Emery collaborated on development.
Salt.....	Vacuum crystallizer	International Salt Co.	Watkins Glen, N. Y.	Process recycles hot mother liquor to dissolve new salt, produces crystals by flash cooling. Can be single or double effect, can use vapor compression if desired.	Operated in 25 ton/day pilot plant. Investment is 60 percent and steam consumption about 55 percent of conventional process. Has no heat exchange surfaces, hence no scaling.
Salt.....	Evaporation.....	Antonio Zoghbi..	Caracas, Venezuela	Package plants for 10–100 T/day using single-effect vapor recompression evaporator.	Developed by Manistee Iron Works. Several more on order.
Silica powder.....	Silicon tetrachloride combustion	Godfrey L. Cabot Co.	Boston, Mass....	Fine silica powder for use in rubber, paints, resins, cosmetics, will be made by burning $SiCl_4$ in hydrogen and air. Similar products formerly made from ethyl silicate.	"Aerosil," a "white carbon black," was developed by Degussa in Germany. Cabot will soon introduce in U. S.
Sodium hypochlorite	Electrolysis.....	Various fisheries..	.....	Makes sod. hypochlorite solns. for fisheries by electrolysis of seawater.	Developed by Frank Negus, handled by Standard Labs.
Sulphur.....	Mining.....	Freeport Sulphur Co.	Bay St. Elaine, La.	Floating power plant (see Water Treatment) provides superheated process water for mining sulphur under water.	Now in use.
Sulphur.....	Flotation.....	Wyoming Gulf Sulphur Co.	Cody, Wyo.....	Concentration of low-grade sulphur ores makes about a 90 percent product at $12/ton.	35 T/day plant.
Sulphur.....	Agglomeration....	Indus. Furnace, S. A.	Columbia, S. A...	Low-grade sulphur ore is ground, agglomerated in hot water, part is floated; gives 99.5 percent S.	Developed by Chemical Construction Corp. Plant to operate soon.
Sulphur.....	Pyrites distillation	Noranda Mines, Ltd.	Hamilton, Ont....	Half of sulphur in pyrites can be distilled off on travelling grate; rest to SO_2 for H_2SO_4.	Plant scheduled to be built soon.
Sulphur, waste recovery	Catalytic converter	J. T. Baker Chemical Co.	Penn Yan, N. Y..	Waste H_2S from CS_2 production is burned with air under pressure, then reacted over catalyst to form sulphur which is scrubbed out in molten sulphur for return to process.	Will be used with company's new electrothermal carbon disulphide process, recovering 1.25 million lb. sulphur/year.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Inorganics (cont.)					
Sulphur dioxide	Fluidized roasting	Brown Co., others	Berlin, N. H.	Pyrites or pyrrhotite fines of 10-14 mesh burned in fluidized bed to give high strength SO_2.	Developed by Dorr Co.; over 30 units on order throughout world! Brown installation operating.
Sulphur dioxide	Compression	Canadian Industries Ltd.	Copper Cliff, Ont.	70 percent SO_2 from O_2 smelting of Ni can be liquefied by compression.	Operation started late 1952.
Sulphuric acid	From magnesium sulphate	Chemiewerk Oranienburg	Radebul, E. Germany	Byproduct is good grade of magnesia. Utilizes $MgSO_4$ from potash production.	In production.
METALS					
Aluminum	Reduction	British Columbia Aluminum Co.		Electrical energy produced as "square" wave of current said to save 30 percent on power.	Process based on quantum mechanics.
Aluminum	Sintering			Slow sintering of powdered metal develops structure with superior fatigue strength at high temperature.	Developed in Switzerland.
Aluminum	Dip coating	General Motors Corp.	Detroit, Mich.	Steel and other ferrous metals are dip coated with aluminum for corrosion resistance.	Can operate continuously. Called Aldip process.
Aluminum plating	Organic electrolytic			Aluminum plated out from ether solution of reagent-grade Al_2Cl_6 in presence of metal hydride such as lithium hydride.	Gives ductile, adherent coatings superior to other non-aqueous baths. Developed by Nat. Bureau of Standards.
Aluminum-silicon	Electrothermal	Apex Smelting Co.	Springfield, Ore.	Aluminum silicate clay smelted electrothermally to yield aluminum-silicon alloy, suitable for introducing silicon into aluminum and possibly titanium alloys.	Process developed with U. S. Bureau of Mines. Construction expected to start early 1953.
Calcium metal	Preferential reaction	Ethyl Corp.	Baton Rouge, La.	Especially reactive calcium of 94-97 percent purity in free-flowing crystal form is separated from sodium-cell sludge by reacting sodium in sludge with an alcohol to form a marketable sodium alcoholate.	Expect reduction of refractory metal oxides of metals such as uranium, titanium, zirconium to be biggest use for this low-cost calcium. Process in operation.
Chromic acid	Recovery	Various		Direct evaporation from plating bath rinse. Eliminates pollution.	Developed by Pfaudler Co. Several units installed; more planned.
Chromium	Recovery			Eliminates pollution. Uses ion exchange on anodizing baths.	Developed by Mutual Chemical Co. of America.
Cobalt	Chemical refining	Sherritt Gordon, National Lead, Howe Sound Co.	Edmonton, Alta; Fredericktown, Mo.; Salt Lake City, Utah	Sulphide ore leached under pressure with sulphuric or ammonia. Solution is oxidized, then reduced with hydrogen to yield metal powder. (See Nickel.)	Process requires no roasting, smelting or conventional refining. Expected to cut production costs. Plants being built. Developed by Chemical Construction Corp.
Hafnium	Hot filament	Atomic Energy Comm.	Oak Ridge, Tenn.	Tetrachloride process, gives 99 percent hafnium.	Developed by Foote Mineral Co. In commercial operation.
Indium	Electrolytic	Consolidated Mining & Smelting Co.	Trail, B. C., Canada	Process yields 99.95 percent pure metal, expected eventually to lower price.	Company plans commercial production of 70,000 lb. per year.
Iron ore	Reduction			Helibeater reduces low grade iron ore with CO at 1,500 deg. F.	Developed by Theodore Swann, Birmingham consultant.
Lithium compounds and metal		Foote Mineral Co.	Sunbright, Va.	Produces lithium salts and metal direct from spodumene without sulphuric acid. Ore contains 6 percent lithium oxide.	New capacity at company's Kings Mountain, N. C., mine will triple U. S. lithium ore output.
Lithium	Ore extraction			Extraction of lithium from two different chemical combinations in same ore, 67 to 97 percent yield.	Developed by U. S. Bureau of Mines.
Manganese	Ammonium carbamate leach	Manganese Chemicals Corp.	Minneapolis, Minn.	Ore is reduced by roasting, then leached with carbamate solution. Mn is eventually precipitated as carbonate.	Plans announced for $2 million plant to treat 200 Tons/day of ore. Process developed by Reginald Dean.
Manganese	Flotation	Manganese, Inc.	Henderson, Nev.	Ore assaying 18-25 percent is upgraded to a 48 percent nodule.	First beneficiation plant for low-grade manganese ore.
Nickel	Chemical refining	Sherritt Gordon Mines, Ltd.	Edmonton, Alta.	Similar to process used for cobalt (q. v.). Sherritt Gordon will produce copper, nickel and cobalt jointly. Will use ammonia leaching.	Chemico reduction process combined with user's ammonia leaching process. $41 million plant to be completed late 1953.
Plutonium	Reactor	North American Aviation	Downey, Calif.	Low-power reactor designed for industrial and institutional use.	Designed. Experimental model to be completed by mid-1954.
Rare earth metals	Reduction			Anhydrous rare earth chlorides are reduced by calcium in refractory oxide-lined containers.	Developed at Iowa State College, produces metals in massive state.
Thallium	Leaching			Volatilization of white arsenic and cyclic leaching of lead smelter flue dust recover thallium values.	U. S. Bureau of Mines development.
Tin-nickel alloy	Plating	Metal & Thermit Corp.	Newark, N. J.	Alloy is 65 percent tin, 35 percent nickel.	Use limited by nickel shortage.
Titanium	Electrolytic	Various		Several new electrolytic processes in pilot plant. DuPont for example, will try out cell electrolyzing titanium tetrachloride in fused alkali chlorides at 400 deg. C. under argon blanket.	Electrolytic processes expected to be more efficient than present magnesium reduction method.
Titanium	Mg reduction	Titanium Metals Corp.	Henderson, Nev.	World's first self-contained plant. Uses electrolytic Mg.	In commercial operation Oct. 1951.
Titanium	Smelting			Titaniferous magnetite is alkaline roasted, leached and smelted to recover vanadium, iron and titanium.	U. S. Bureau of Mines laboratory development.
Titanium carbide	Sintering	Kennametal Inc.		High-pressure firing inside naval gun barrel produces uniform density of powdered metal parts.	Used for jet engine turbine blades.
Uranium	Acid leaching	Eldorado Mining Co.	Beaverlodge, Sask.	Chemical Construction's acid leaching process has been tried out on uranium ore concentrates.	Believed in pilot plant stage; probably suited to other uranium concentrates.

Metals (cont.)

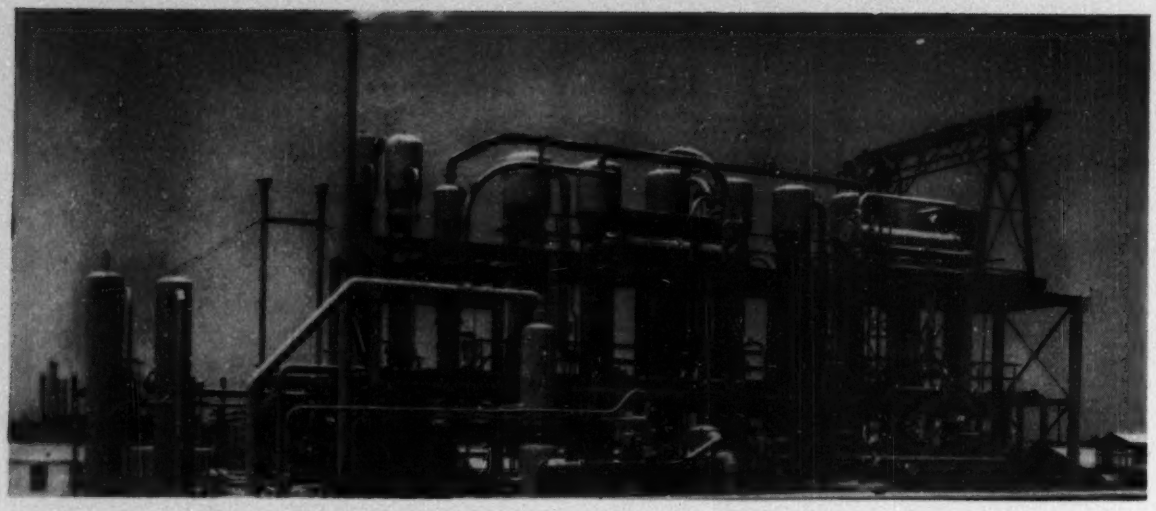


SORBITOL: Atlas Powder Co., Atlas Point, Wilmington, Del.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Metals (cont.)					
Uranium	Ion exchange	West Rand Consolidated Mines, others	Krugersdorp, South Africa	Uranium removed from gold ore residues by ion exchange processes developed for AEC.	U. S. and British capital building plants.
Uranium	Ore treatment	U. S. Vanadium Co.	Uravan, Colo.	New process recovers uranium and vanadium from ores with high lime content.	Recently installed.
Uranium		Various		Uranium is extracted from phosphate rock via wet process phosphoric acid for concentrated superphosphate.	Blockson Chemical is operating. Int. Minerals & Chem. Corp., Virginia-Carolina and Texas City Chemicals are building plants.
Vanadium	Ore processing			Recovery from western phosphate rock by beneficiating, smelting and roast-leach process.	Extensive tests by U. S. Bureau o Mines in Oregon and Idaho.
Zinc	Arc smelting	New Jersey Zinc Co.	Palmerton, Pa.	Zinc oxide ore, coke and flux are preheated to 850–900 deg. C., then charged to 3-phase arc furnace. Zinc vapor condenses in zinc spray condenser.	Overall power in full scale plant less than 3,000 kwh. per ton slab zinc. First successful use of arc furnace for zinc. Sterling process.
Zirconium	Mg reduction	U. S. Bureau of Mines	Albany, Ore.	Ductile Zr, 7000 lb. a month.	Developed by Bureau of Mines. Demonstration plant. Foote Mineral has commercial plant at Exton, Pa.
FINE ORGANICS					
Antibiotics	Automatic	Commercial Solvents Corp.	Terre Haute, Ind.	Fully automatic process for penicillin, bacytracin, etc.	First automatic process for antibiotics.
Antibiotic	Fermentation	Abbott Laboratories, Upjohn Co.		New commercial antibiotic, developed by Eli Lilly & Co., licensed to Abbott and Upjohn.	Called Erythromycin.
Antibiotic	Fermentation	Chas. Pfizer & Co.	Brooklyn, N. Y.	Called Magnamycin, new antibiotic now undergoing clinical tests, appears non-toxic but is effective against organisms resistant to earlier antibiotics.	Ineffective vs. gram-negative bacteria.
Arabogalactan (wood gum)	Solvent extraction			Water soluble gum like gum arabic from waste larch wood by solvent extraction.	Developed by Western Pine Association.
Azelaic acid	Ozone oxidation	Emery Industries, Inc.	Cincinnati, Ohio.	Azelaic acid and co-product pelargonic acid to be made by ozone oxidation of oleic acid. Displaces chromic acid oxidation. Will use largest ozone generator.	New process, ready for operation by mid-1953, developed by joint research of Emery and Welsbach Corp.
Blood, human	Fractionation			Plasma heat stability, improved by prothrombin removal, permits heat treatment to kill the virus causing hepatitis.	Developed at Harvard Medical School.
Calcium gluconate	Electrolytic oxidation			Starting with invert sugar, makes easy separation to yield high-purity levulose as co-product.	Research done by Sugar Research Foundation.
Chlorophyll	Continuous extraction	Archer-Daniels-Midland Co.	Mankato, Minn.	Converted soybean extractor removes chlorophyll from alfalfa. Miscella is saponified, converted to copper or iron salt.	Process gets about 5–8 lb. chlorophyllins/ton alfalfa. Plant operating.
Chlorophyll	Continuous extraction	National Chlorophyll & Chemical Co.	Lamar, Colo.	Continuous solvent extraction of alfalfa using Kennedy extractor.	Plant for 4,000 lb./mo. under construction.
Citric acid	Deep fermentation	Stauffer Chemical Co.	Callender, Calif.	Accelerated fermentation based on beet sugar molasses.	Announced Oct. 1951.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Fine Organics (cont.)					
Citric acid	Deep fermentation	.....	.....	Addition of a little methanol to culture medium permits deep tank fermentation, increases yield 12 times using blackstrap.	Developed by Northern Regional Lab, USDA, at Peoria, Ill. Pfizer, at Groton, Conn., and Miles Labs, at Elkhart, Ind., also have new deep tank processes.
Cortisone	Total synthesis	Merck & Co.	Rahway, N. J.	30-step process starts with ethoxypentadiene and benzo-quinine, is much simpler than earlier total syntheses. Avoids problem of getting oxygen into 11-position of steroid nucleus.	Will not yet supercede ox-bile process but with further development may eventually make possible production from cheap coal tar source.
Cortisone	Fermentation	Upjohn Co.	Kalamazoo, Mich.	Uses progesterone from vegetable sources rather than desoxycholic acid. Oxygen introduced to 11-position by fermentation.	Believed process opens way to cheaper cortisone, simpler process. $3 million plant is planned.
Cortisone	Microbiological synthesis	Syntex, S. A.	Mexico City, Mexico	Steroid is oxidized with a fungus, then hydrogenated to yield a cortisone intermediate.	Results of research have been reported.
Cyanoacetic acid	Solvent extraction.	Kay-Fries Chemicals, Inc.	West Haverstraw, N. Y.	Recovers product from aqueous solution. Solvent is methyl isobutyl ketone or mesityl oxide. Solvent is steam distilled, acid crystallized from water.	In production at rate of 1 million lb. per yr.
DDT	Fluosulfonic process	Dominion Rubber Co. Ltd., Naugatuck Chemicals Div.	Elmira, Ontario	Monochlor benzene and chloral are reacted with fluosulfonic acid rather than sulphuric as condensing agent. Reaction speed increased 20-30X.	Saves 20 percent in investment, increases yield 10 percent, cuts manufacturing cost. Process available for licensing.
Dextran	Fermentation	Commercal Solvents Corp., others	Terre Haute, Ind.	Cane sugar is fermented to glucose polymers, isolated, partially depolymerized with mineral acid, fractionally precipitated with an alcohol.	Used as plasma extender. Several plants starting or building.
Drying oil	Hydrolysis	Ethyl Corp.	Baton Rouge, La.	Byproduct from ethyl chloride process is hydrolyzed to produce crude drying oil.	Duplicate unit installed in new Houston plant.
Fluorocarbons	Electrolytic	Minnesota Mining & Mfg. Co.	Hastings, Minn.	Electrolytic process makes fluorocarbons using anhydrous HF.	Commercial production started late 1951. Developed at Univ. of Fla. $600,000 plant under construction.
Furfuryl alcohol	Continuous hydrogenation	Quaker Oats Co.	Memphis, Tenn.	Details not available	
Glucoronolactone	Synthetic	Corn Products Refining Co.	Argo, Ill.	Starts with dextrose. Details not available.	Plant in operation.
Guar gum	Extraction	.....	Kennedy, Texas	New agro-industrial product has good sizing properties. Process for extraction and purifying now set.	First plant under construction April 1952.
Hormones	Electrochemical synthesis	.....	.....	Electrolytic oxidation and reduction techniques promise increased yields, reduced costs.	Research being done at Pratt Institute.
Hydrocarbon sulphonates	SO_3 sulphonation	Ninol Laboratories	Chicago, Ill.	Sulphonation with stabilized SO_3 is cheaper, makes products unobtainable by other methods.	Plant being built for 10 million lb./yr.
Inositol	Precipitation	Staley Mfg. Co.	Decatur, Ill.	From corn steep liquor by precipitation and hydrolysis of crude phytate.	Commercial plant announced July 1951.
Levulose	Hydrolysis	.....	.....	From beet sugar by hydrolysis and lime separation. 5-to-1 cost reduction.	Pilot plant at University of Colorado.
Lubricants, synthetic	Oxidation	.....	.....	High boiling esters of pinic acid basis for new series of synthetic lubricants.	Developed in U. S. Government labs
Maleo-pimaric acid	.....	Several considering	.....	Crude pine gum is diluted with turpentine, filtered, centrifuged and reacted with maleic anhydride. Crystals are centrifuged, washed, dried.	Developed on pilot plant scale by USDA at Olustee, Fla. Yield about 20 percent on trash-free gum. Used in printing inks.
Montan wax	Bleaching	American Lignite Products Co.	Ione, Calif.	Chromate oxidation bleaching process.	Commercial operation was expected mid-1951.
Montan wax	Extraction	Humacid Co.	California	Two-step extraction, first with aromatic solvent, then with aliphatic hydrocarbon solvent. Controls resin content of wax.	Full scale production.
Niacin	Synthetic	Merck & Co.	Rahway, N. J.	New process uses NH_3 and formaldehyde, rather than scarce pyridine.	To be in operation soon. Member of B vitamin family.
Niacinamide	Synthetic	Nepera Chemical Co.	Harriman, N. Y.	From acetaldehyde and NH_3 via methyl ethyl pyridine. Needs no scarce pyridine.	In operation.
Nitrofuran compounds	Synthetic	Norwich Pharmacal Co.	Norwich, N. Y.	Automatic temperature and cycle control of nitration of furfural in presence of acetic anhydride needed owing to high heat of reaction. Resulting 5-nitro-furfural diacetate reacted with "semicarbazide" (hydrazine plus urea) to antibactial 5-nitrofurfural semicarbasone.	Product Furacin has antimicrobial action similar to antibiotics but does not develop resistant bacterial strains. Furans and nitrofurans expected to find wide drug and solvent use.
Phthalocyanine greases	Gelling	.....	.....	Phthalocyanine-gelled greases are satisfactory above 180 deg. C.	Developed at Navy Research Lab.
Pinane hydroperoxide	Hydrogenation-oxidation	.....	.....	Pinene catalytically hydrogenated to pinane, then oxidized to hydroperoxide.	Developed by USDA at Olustee, Fla.
Polycarboxylic acids	Oxidation	.....	.....	Coal suspended in alkaline medium is treated with oxygen under heat and pressure.	Pilot studies at Carnegie Tech. Market survey by Scientific Design.
Polyvinyl pyrrolidone	Synthesis	Schenley Laboratories	.....	Process starting with ethanolamine and butyrolactone avoids hazards of acetylene and high pressure.	.....
Pyridines	Synthetic	Carbide & Carbon Chemicals Div.	Institute, W. Va.	From acetaldehyde and ammonia.	Operation in 1952.
Pyridines	Synthetic	Phillips Chemical	Houston, Tex.	From acetaldehyde and ammonia.	$3 million plant; operation in 1952.

Fine Organics (cont.)

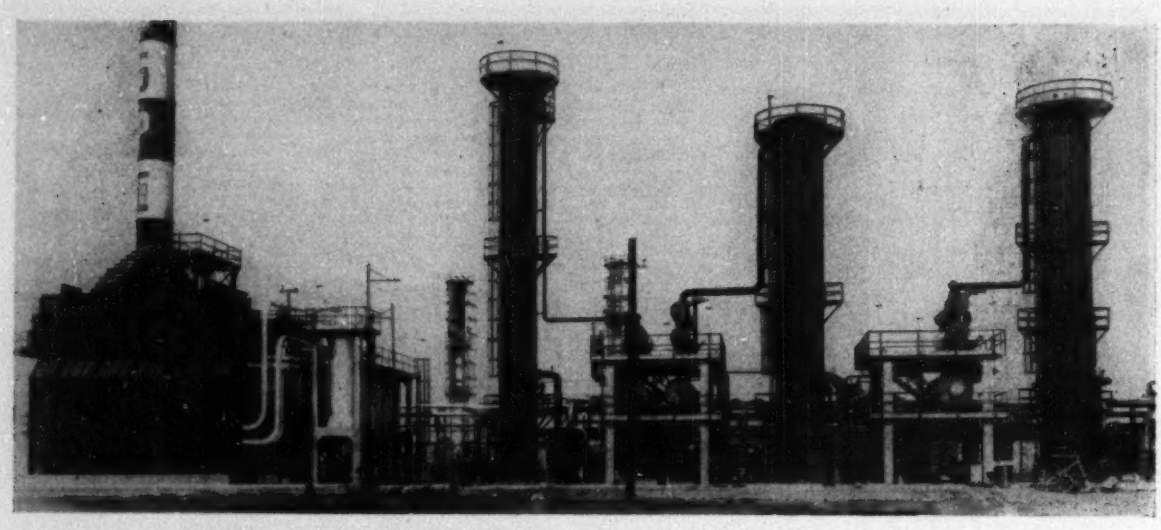


ISOPROPYL ALCOHOL: Shell Chemical Co., Dominquez, Calif.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Fine Organics (cont.)					
Sorbitol	Catalytic	Atlas Powder Co.	Atlas Point, Del.	Continually improved since introduction in 1947, process uses nickel catalyst to reduce corn sugar at high pressure with hydrogen. Product purified by ion exchange.	Improved continuous process has permitted Atlas to quadruple capacity since 1951.
Tetraethyl lead	Continuous	E. I. duPont de Nemours & Co.	Deepwater, N. J.	Increases output, eliminates need for special alloy equipment.	Plant for 50 million lb./yr. announced early 1951.
Vanillin	Sulphite liquor oxidation	Ontario Paper Co.	Thorold, Ont.	Uses lime instead of NaOH for forming the lignosulphonate. Specific reaction conditions are critical.	$1.3 million plant scheduled for 1952 startup. Capacity 400,000 lb/yr.
Various	Mechanical activation	Carlisle Chemical Works	Reading, Ohio	Metal catalysts cut in presence of reactants in Cimmac reactor for reduction, Grignard, etc.	Developed by Carlisle and Cincinnati Milling Machine Co. Available in commercial sizes.
Vitamin A	Synthesis from cyclohexanone	Glaxo Laboratories	Middlesex, England	Replaces expensive beta-ionone as starting material with cheaper cyclohexanone.	In research stage.
Vitamin A (crystal)	Gelatine coating	Chas. Pfizer & Co.	Groton, Conn.	Enables Vitamin A to be used as dry crystals by gelatine coating process.	$2 million plant in use since early 1951.
Vitamin B_{12} supplement	Fermentation	Pacific Yeast Products; Atlantic Yeast Co.	Wasco, Calif.; Brooklyn, N. Y.	Feed supplement produced using selected strain of bacteria on sugar-containing byproduct.	Development sponsored by Western Regional Research Lab.
Wax, sugar-cane	Solvent extraction	Colonial Sugars Co.	Gramercy, La.	Cane press cake is solvent extracted with hot acetone.	Developed by Cuban American Sugar Co. and S. C. Johnson & Son, Inc., in Cuba.
HEAVY ORGANICS					
Aniline	Continuous	Allied Chemical & Dye Corp.	Moundsville, W. Va.	Nitrobenzene will probably be made continuously via the Biassi process. Reduced to aniline by continuous catalytic hydrogenation.	Plant under construction; certificate for $2.3 million.
Benzene	Cracking and oxidation of paraffins	All-Union Institute of Gas & Synthetic Fuel	Ishambejewo, Russia	Hydrocarbon gases are catalytically cracked to olefines, then oxidized with air to benzene and other aromatics. Reaction temp. about 800 deg. C.	Pilot plant results were promising; full-scale plant a strong possibility. Developed by Joseph Winkler.
Benzene	Pressure refining	Scholven Chemie A. G.	Germany	Catalytic process for coke oven benzene. Higher purity and yield.	Introduced in several plants.
Coal char	Fluidized coking	Illinois Coal Products Commission	Chicago, Ill.	Fluidized coal oxidized at 300 deg. to destroy resinous compounds, then coked in fluidized state mixed with hot char at 500–800 deg. C. Pilot plant, 2 T/hr., started mid-1952.	Char can be burned direct or briquetted. Typical yield per ton coal is 1,320 lb. char; 15 gal. tar, 8,200 cu. ft. of 580-Btu. gas; 35 lb. sulphur in H_2S. Developed by A. D. Singh.
Coal chemicals	Hydrogenation	Carbide & Carbon Chemicals Div.	Institute, W. Va.	Large scale "pilot plant" treats 300 T/day of coal to produce aromatics by improved high-pressure hydrogenation. Operates at 4,–6,000 psi. and 840–1,000 deg. F. No converter coking.	Believed to be first high-pressure coal hydrogenation designed primarily for chemicals production. Rate increase to 550 T/day planned. Plant cost $11 million. Operating as of May 1952.
Coal chemicals	Fischer-Tropsch	South African Coal, Oil & Gas	Johannesburg, So. Africa	Oil from coal using modified catalyst and completely redesigned reactor; higher yield.	Engineered by M. W. Kellogg Co. Plans announced for commercial plant in April 1951.
Coal products	Low-temperature carbonization	Pittsburgh Consolidation Coal Co.	Library, Pa.	Char makes good boiler fuel. Tar can be refined to creosotes, electrode carbon, etc.	Pilot plant completed late 1952.
Coal tar	Vacuum distillation	Various	.....	Vacuum in second stage of 2-stage continuous tar distillation. Higher yields of anthracene, reduced cracking, less corrosion.	European installations of 150–400 T/day.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Heavy Organics (cont.)					
p-Cresol	p-Cymene oxidation	Hercules Powder Co.	N. J. Delaware River industrial area	Similar to phenol-from-cumene process, using similar or same equipment. Para-cymene is oxidized, splits to para-cresol and acetone.	Uses dehydrogenated mono-cyclic terpenes from Georgia and Mississippi naval stores operations as raw material.
p-Cresol	Toluene hydrolysis	Hydrocarbon Chemicals, Inc.	Newark, N. J.	Toluene vapors bubbled through H_2SO_4 and boron catalyst.	Plans announced in June 1951 for 10,000 lb./day.
Ethyl alcohol	Fermentation	Grain Processing Corp.	Muscatine, Iowa	Fungal analyase replaces barley malt in converting starch to sugars.	Developed by USDA. Experimental commercial operation.
Ethylene glycol	Ethylene oxidation (?)	Hancock Chemical Co.	Long Beach, Calif.	Belgian process developed by Société Carbochemique.	Engineered by Scientific Design. $4 million plant also to produce ethanolamines.
Fuel gas	Coal gasification	Alabama Power Co. and U. S. Bureau of Mines	Gorgas, Ala.	Underground gasification of coal produces fuel gas of 120–180 Btu./cu. ft. Process demonstrated by Sinclair Coal and Missouri School of Mines, at Hume, Mo.	Experimental work. Tests made using electric heaters in bore holes to eliminate need for drilling air passages.
Iso-octyl alcohol	Oxo	Gulf Oil Co.	Port Arthur, Texas	Will react a heptene olefin, CO and hydrogen at relatively high pressure, low temperature, in presence of cobalt catalyst, producing iso-octaldehyde which is hydrogenated to iso-octyl alcohol.	This is third petroleum company to develop an iso-octyl alcohol synthesis based on German-developed Oxo process.
Lard	Reforming	Armour & Co.	Fort Worth, Texas	Reforming with heat using sodium methoxide catalyst makes lard similar to vegetable shortening.	Present output solely for bakeries.
Lignite char	Low-temperature carbonization	Texas Light & Power Co.	Rockdale, Tex.	Lignite carbonized in fluidized bed at 950 deg. F. Char power plant fuel is competitive with other fuels.	Plant handling 7,000 T/day lignite for power for Alcoa Al plant is under construction.
Napalm	Continuous	Ferro Chemical Corp.	Cleveland, Ohio	Continuous process with automatic proportioning and metering equipment.	Started operation in Aug. 1951. $300,000 plant produces 1 million lb./mo.
Nitroglycerine	Continuous nitration	Canadian Industries Ltd.	Calgary, Alta.	Saves on equipment cost, labor, building space. Small amount of material in process reduces hazards. Can be adapted to other nitration products.	Developed in Switzerland by M. Biazzi. Also being installed by DuPont at Martinsburg, W. Va.
Oils, synthetic	Improved Fischer-Tropsch	U. S. Bureau of Mines	Louisiana, Mo.	Synthesis gas is injected at 450 psi. along with high-boiling-point oil into reactor containing iron catalyst. Flow produces jiggling catalyst bed, gives 75–85 percent conversion to gasoline, alcohols, diesel and heavy oils.	Process gives 6–8 times capacity of German units per cu. ft. reaction space, lowers costs, permits use of synthesis gas from coal. Pilot plant scale, using about 2 million cfd. synthesis gas.
Paraffin, hard	Modified Fischer-Tropsch	Krupp-Kohlenchemie Gmbh.	Wanne-Eikel, West Germany	Details not available	Developed in collaboration with Ruhr Chemie and Lurgi.
Phenol	Cumene oxidation	Hercules Powder Co., others	Gibbstown, N. J., others	Cumene oxidized, splits to phenol and acetone. Needs no sulphur or chlorine.	Plans for five plants announced as of Feb. 1952. Hercules plant, $8 million, under construction.
Phthalic anhydride	Phenanthrene oxidation			Oxidation of phenanthrene with Na-V_2O_5 catalyst in fluidized bed.	Developed by British Coal Utilization Research Assn. In laboratory.
Starch, corn	Drying	American Maize Products Co.	Hammond, Ind.	Flash dryer handles feed at 35 percent moisture, delivers 300,000 lb./day dry starch.	First major unit for corn starch went on stream Feb. 1952.
Sugar, beet	Continuous diffusion	Spreckles Sugar Co.	Woodland, Calif.	Battery of multiple cells provides continuous beet extraction.	Manufactured by Oliver United Filters. First test unit 1948.
Sugar, cane	Defecation	Various	Various	New defecant precipitates impurities as fast filtering cake. Composition not disclosed.	Developed by Elguanite Corp. In use at several sugar refineries.
Synthesis gas	Purification			H_2S, organic S and CO_2 are removed by low-temperature selective extraction. Known as Rectisol. Nature of solvent undisclosed.	Developed in Germany by Lurgi. Offered by Blaw-Knox. Going into South African Fischer-Tropsch plant.
Synthesis gas	Carbon dioxide removal	U. S. Bureau of Mines	Bruceton, Pa.	Carbon dioxide is removed from synthesis gas by absorption in hot concentrated potassium carbonate at 300–600 psi. Solution regenerated by low-pressure steam stripping.	Expect process also to be useful in ammonia synthesis.
Urea	Recycle			New Swiss process separates unreacted ammonia and carbon dioxide by special absorber solution, prior to recycle and separate repressuring. Novel crystallization crystalizes from urea melt for better crystal control.	"Inventa" process offered in U. S. by Vulcan Copper & Supply Co. at $25,-$35,000 investment/daily ton capacity. Expect 98 percent yield on ammonia.
Urea	Oil slurry recycle			Solid carbamate is recycled as slurry in mineral oil.	Developed by Pechiney in France. Offered by Foster Wheeler Co. Two plants planned.
Urea	Once-through	Solvay Div., Allied Chemical & Dye Corp.	South Point, Ohio	Unconverted carbamate dissociates and is vented from process.	Plant in operation.
Water gas	Fluidized bed			Steam introduced below fluidized bed of waste coal.	In pilot plant as of May 1951 by British Fuel Research Station.
p-Xylene	Low-temperature recrystallization	Humble Oil & Refining Co.	Baytown, Tex.	Mixed xylenes are crystallized at −95 deg. F., recrystallized at 0 deg. F., using scraped-surface heat exchangers.	Plant operation scheduled for early 1953; to supply p-xylene to DuPont for Dacron via terephthalic acid.
PETROLEUM AND NATURAL GAS					
Acetylene	Partial oxidation	Carbide & Carbon Chemicals Div.	Texas City, Tex.	Natural gas partially oxidized with 95 percent O_2 at 2,700 deg. F. Purified by water scrubbing.	Plans announced May 1951 for large semi-commercial plant. Based on Sachse process.
Acetylene	Partial oxidation			Uses unspecified solvent purification.	Modified Sachse process developed by Badische, licensed by Chemico.

Petroleum and Natural Gas (cont).

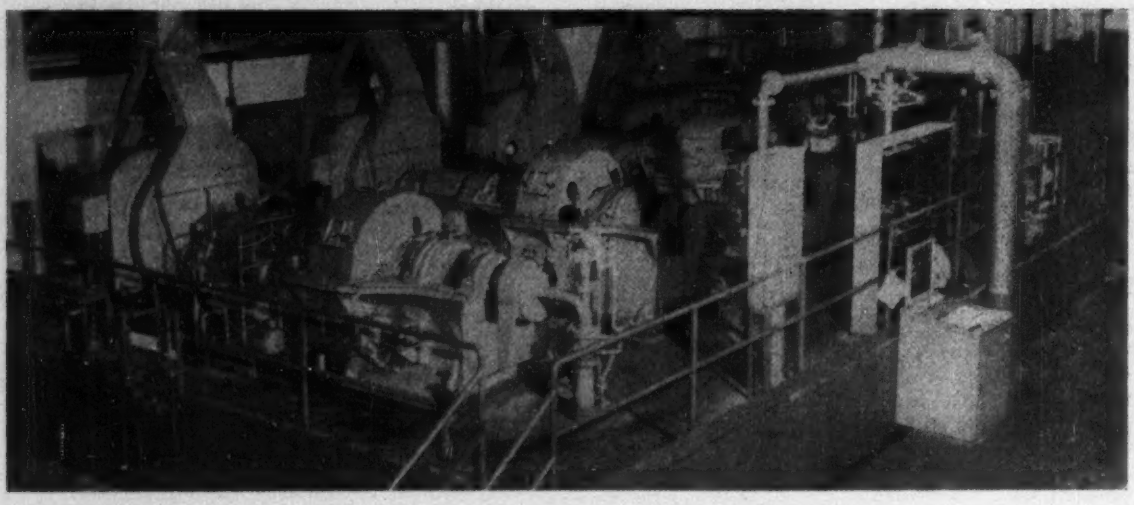


PETROLEUM AROMATICS: Eastern States Petroleum Co., Houston, Tex.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Petroleum and Natural Gas (cont.)					
Acetylene	Partial oxidation	Monsanto Chemical Co.	Texas City, Tex.	Partial oxidation of natural gas. Purification by absorption.	Plant under construction. Believed based in Sachse process.
Aromatics	Selective adsorption	Sun Oil Co.	Marcus Hook, Pa.	Aromatics in Houdriformer product adsorbed on silica gel, selectively desorbed with butane, then mixed xylenes.	Plans announced for plant for 13 million gal./yr. benzene, 30 million gal./yr. toluene to be ready 1953. Arosorb process.
Aromatics	Solvent extraction	Various	Various	Aromatics extracted from hydrocarbons with diethylene glycol. High recovery.	Developed by Dow and UOP. Udex process. One unit operating; others under construction.
Avgas blending stock	Catalytic reforming	Socony-Vacuum Oil Co., others	Augusta, Kan.	Thermofor catalytic reforming process uses cogelled chromia-alumina bead catalyst to reform naphtha to mixed aromatics for avgas blending.	Low-pressure process developed by Standard Oil Co. (Ohio). Similar to Thermofor cat. cracking. Coking no problem.
Butadiene				Pelleted Ca-Ni phosphate catalyst increases yields from 70 to 92%.	Catalyst developed by Dow Chemical Co.
Chemicals	Various	National Petro-Chemical Corp.	Tuscola, Ill.	Will produce LP-G and chemicals from pipeline gas including ethane, ethyl alcohol, ethyl chloride.	$32 million plant for natural gas chemicals announced Jan. 1952.
Ethylene	Naphtha cracking	Imperial Chemical Industries	Wilton, Eng.	Pyrolysis at 1,700 deg. F. in presence of steam. Motor fuel and propylene produced.	Plant construction by M. W. Kellogg Co.
Ethylene	Autothermic cracking			Heat of reaction for cracking ethane provided by introducing air or O_2.	Developed by UOP. Demonstrated in pilot plant.
Ethylene	Steam pyrolysis of ethane			Steam serves as heat-transfer medium, diluent and carbon formation suppressor. Operates with steam temperature of 1,700–1,900 deg. F.	Research under way at Midwest Research Institute.
Ethylene oxide	Fluid bed	Atlantic Refining Co.	Philadelphia, Pa.	Ethylene is oxidized in fluidized bed of catalyst, giving better temperature control, higher yields, compared with fixed-bed processes. Operates at 100 psi., 500 deg. C.	Developed jointly by Atlantic and Vulcan Copper & Supply Co. Latter will build commercial plants.
Ethylene oxide	Oxidation	Solvay Process Div.	Orange, Texas	Direct oxidation of ethylene, requires no chlorine.	Developed by Scientific Design Co. Plant announced Jan. 1952.
Fuel gas	Reforming	Rochester Gas & Electric Corp.	Rochester, N. Y.	Reforms natural gas to 300 Btu. gas or liquid hydrocarbons to 1,000 Btu. gas.	Plant for 1 million cu. ft./day started up in Sept. 1951, using Koppers-Hasche regenerative furnace.
Gasoline	Alkylation	Various		Compartmented reactor gets better yields, uses less H_2SO_4.	Developed by M. W. Kellogg Co.
Gasoline	Gum removal	Esso Standard Oil Co.	Bayway, N. J.	Formaldehyde replaces sulphuric acid in removing gum forming constituents.	Announced Jan. 1952.
Gasoline	Catalytic cracking	British-American Oil Co.	Edmonton, Alta.	Reactor and regenerator are in single tower. Cheaper.	First unit installed, others underway. Orthoflow process. (Kellogg)
Gasoline	Catalytic cracking			Model IV fluid cracking unit uses new catalyst circulation system to reduce height by 30 percent.	Developed by Standard Oil Development Co.
Gasoline	Catalytic hydroforming	Pan-Am Southern Corp.	Destrehan, La.	Uses fluidized catalyst technique. Upgrades naphtha to higher octane ratings. Called Hydroforming.	First unit for 2,000 bbl./day now in operation. Developed and engineered by M. W. Kellogg Co.
Gasoline	Catalytic reforming	Atlantic Refining Co.	Philadelphia, Pa.	Uses silica-alumina catalyst, impregnated with Pt or Pd.	Now in commercial operation. Gives high yields of aromatics.
Gasoline	Catalytic reforming			Continuous catalytic reforming of low-octane naphthas. Catalyst is highly selective.	Developed by Houdry Process Corp. "Houdriforming."
Gasoline	Catalytic reforming			Upgrades low-octane stocks into premium fuels. Regenerative moving-bed process, chromia-alumina gel catalyst.	Developed by Socony-Vacuum Oil Co. Four commercial units scheduled.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Petroleum and Natural Gas (cont.)					
Gasoline	Catalytic reforming	Union Oil Co.	Los Angeles, Calif.	Upgrades low-octane naphthas with cobalt molybdate catalyst. Known as Hyperforming, uses Hyperflow principle for catalyst lift.	
Gasoline, cracked	Stabilizing			NaOH wash before exposure to air increases stability.	Developed by Standard Oil Development Co. "Sodafining."
Lubricating oils	Acid treatment	Various	Italy	Two-stage centrifugal process. Short contact time avoids chemical action, increases yield and reduces acid consumption.	Several refineries using this process.
Paraffin wax	Continuous molding	Magnolia Petroleum Co.	Beaumont, Tex.	Uses modified chocolate molding machine. Cleaner, less labor, automatic packaging.	Process in use on plant scale.
Paraffin wax	Continuous extrusion	Texas Co.	Port Arthur, Tex.	Wax is continuously extruded in ribbon form and cut to length. Reduces labor.	Operation of 66 T/day plant announced in Sept. 1951.
Petroleum hydrocarbons	Desaponification			Soap-containing charge is acidified, salt and aqueous phase are coalesced by electric field.	Developed by Petrolite Corp.
Petroleum hydrocarbons	Electric treating			Electric field coalesces dispersed aqueous phase from acid, caustic, or doctor treating.	Developed by Petrolite Corp.
Petroleum hydrocarbons	Contact coking	Shamrock Oil & Gas Corp.	Sunray, Texas	Coke deposited on moving bed of coke particles. Continuous process, yields high-quality coke. Uses Hyperflow lift principle.	Plant in operation, eliminating start-up difficulties. Developed by Lummus Co.
Petroleum hydrocarbons	HF extraction			Countercurrent stream of liquid HF removes coke-formers and S compounds from cracking charge stocks and naphthas.	Developed by Standard Oil Co. (Indiana). Designs prepared up to 40,000 bbl./day.
Petroleum hydrocarbons	Catalytic desulphurization	Anglo-Iranian Oil Co. Ltd.	Llandarcy, Wales	Process applicable to sour crudes gives virtually complete yield of middle distillates without desulphurizing loss inherent in acid treatment. Eliminates 90 percent of sulphur.	Autofining process developed by Anglo-Iranian; M. W. Kellogg licensed to build U. S. plants.
Petroleum hydrocarbons	Hydrodesulphurization	Union Oil Co.	Wilmington, Calif.	Combines catalytic hydrogenation and desulphurization of a distillate with 4.5 percent S and 700 deg. F. E. P.	Plans announced in June 1951 for a plant installation.
Petroleum hydrocarbons	Vacuum distillation	Phillips Petroleum Co.		Operates at 100–800 microns. Higher yields of high quality cracking feed stock.	Process in use on plant scale.
Shale oil	Autocombustion	U. S. Bureau of Mines	Rifle, Colo.	Requires no outside fuel. Shale flows downward in retort against burning gas.	Unit for processing 160–400 T/day completed late 1952 by Blaw-Knox. Refining unit contract has been let to Catalytic Const. Co.
PLASTICS					
Fluorocarbon	Continuous	M. W. Kellogg Co.	Jersey City, N. J.	Kel-F to be made by new continuous process, probably at lower cost, permitting price decrease.	Operation expected end of 1952 as of Sept. 1952.
Foamed plastic	Chemical blowing	Lockheed Aircraft Co.	San Diego, Calif.	Isocyanate or phenolic base foam plastic fills cavities in aircraft structures, provides stiffening.	Licensed to American Latex Co. and Nopco Chemical Co.
Plastic laminates	Bonding to glass	Various		Vinyl chlorosilane and methacrylato chromic chloride improve bond between polyester resin and glass fibers.	In use.
Polyester film	Condensation polymerisation	E. I. duPont de Nemours & Co.	Circleville, Ohio	Condensation of ethylene glycol and terephthalic acid. Known as Mylar, resembles Dacron.	Plans for new $10 million plant announced. In experimental production at Buffalo.
Polyester, modified	Polymerization			Based on ethylene glycol, adipic acid and diisocyanate. Uses: rubber heels, cable covers, fabric coatings.	Developed in Germany by O. Bayer. Called Vulkollans.
Polyethylene, modified	Chlorosulphonation	E. I. duPont de Nemours & Co.		Polyethylene is chlorosulphonated to make ozone-resistant elastomer.	Called Hypalon S-2.
Teflon-metal mixtures	Sintering	U. S. Gasket Co.	Camden, N. J.	Teflon properties improved for many purposes by combining with inorganic fillers and/or metal particles. Mixture is compressed and sintered as in powder metallurgy.	Reduces cost compared with straight Teflon, improves physical and mechanical properties for such uses as bearings, pump impellers.
PULP AND PAPER					
Chemigroundwood pulp	Mechano-chemical			Uses hardwoods. Chemical cook of logs before grinding.	Developed by N. Y. State College of Forestry. Three pilot plants.
Dissolving pulp	Modified sulphate	International Pulp & Paper Co.	Natchez, Miss.	First plant for making dissolving pulp from hardwood.	Plant operating January 1951; plans announced to double capacity, May 1951.
Dissolving pulp and kraft	Kraft			Logs chipped without debarking; bark separates during process.	Developed by Univ. of Fla.; 3 T/day pilot plant planned fall 1951.
Hardboard	Resin-binder	Anacortes Veneer, Inc.	Anacortes, Wash.	Douglas fir veneer waste is chipped, steamed, cooked, ground, mixed with 1–3 percent resin, felted, pressed and cured, all in semi-dry condition.	Million-dollar automatic plant turning out 90,000 sq. ft. 1/8-in. hardboard per day with 30 men.
Hardboard	Non-chemical	Oregon Lumber Co.	Dee, Ore.	Requires less hp., bypasses debarking step, uses no chemicals. Uses waste Douglas fir slabwood.	$2.5 million plant in operation.
Kraft corrugating medium	Semi-chemical	Camp Mfg. Co.	Franklin, Va.	Deaeration and pre-soaking of chips used in continuous process.	Used in 50 T/day plant.
Kraft paper	Kraft			Made from mixture of Southern pine waste wood and normal pine pulp.	Developed by Herty Foundation, Savannah, Ga.
Lignosol	Concentration	Lignosol Chemicals, Ltd.	Quebec City, Quebec	Concentrated lignin liquor or powder made from waste sulphite liquor.	Plant under construction as of Oct. 1952.

Pulp and Paper (cont.)



FIBERBOARD: Fiberboard Products, Inc., Antioch, Calif.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Pulp and Paper (cont.)					
Soda pulp.....	Cold caustic digestion	Green Bay Pulp & Paper Co.	Green Bay, Wis..	Chips soaked 2–3 hr. in 2.5 percent NaOH at room temp., drained, steamed, pulped in double-disk refiner. Cycle requires 4 hr. Used as 1 percent stock.	Being used as 25–60 percent mixed with semi-chemical pulp for making corrugate.
Sulphate pulp.....	Sulphate.....	.....	.....	Continuous process eliminates prehydrolysis, pulp is satisfactory for viscose and acetate manufacture.	Developed at University of Florida.
Sulphite pulp.....	Evaporation.....	Various.....	.....	Wastes from sulphite pulping concentrated in special non-fouling evaporator and burned.	Developed by Kurt Rosenblad. Rhinelander plant in operation. Three other Wisconsin mills to use; equipped by Gen'l. American Transportation Co.
Sulphite pulp.....	Evaporation.....	.....	.....	Lime in waste liquor crystallizes on bed of lime salts, eliminating fouling.	Built by Struthers-Wells, trials conducted early 1952.
Sulphite pulp.....	Ammonia pulping..	Crown Zellerbach.	Lebanon, Ore....	Wood cooked in ammonium bisulphite. Eliminates waste disposal problem.	Commercial plant under construction, Dec. 1951.
Sulphite pulp.....	Lignin extraction..	.....	.....	Uses triethylene glycol; gives more pulp, lignin byproduct.	Developed by Univ. of Wash., experimental use by Weyerhaeuser Timber Co.
RUBBER					
Cold rubber.....	Oil master batch..	Nine plants.....	.....	Cold rubber is extended 25 percent by admixture of latex with 25 percent of cheap petroleum-base oil in water emulsion.	Extends cold rubber capacity 25 percent without impairing quality; also lowers cost 4c. per lb.
Cold rubber.....	Polymerization....	B. F. Goodrich Chemical Co.	Port Neches, Texas	Reaction time cut from 13 to 9 hours using new water treatment to form complex ions.	Less exact control now required.
Cold rubber.....	Rosin addition....	U. S. Rubber Co.	Naugatuck, Conn.	Rosin chemicals added to extra tough cold GR-S makes product 30–50 percent more abrasion resistant than standard cold rubber. More resistant to heat and flex-cracking.	In pilot plant.
Ebonite.....	Latex derived.....	.....	.....	Black vulcanized hard rubber now made directly from latex, bypasses dry processing, competitive with resin.	Developed in Holland.
Fluoro-rubbers.....	Synthesis.....	Minnesota Mining & Mfg. Co.	St. Paul, Minn...	Butyric acid converted in Simons cell to perfluoro butyric acid which is esterified, reduced, esterified and polymerized to rubber-like plastic.	Resistant to temperature, impervious to ozone, fuels, most solvents. Production entirely for Air Force at present.
Polybutadiene rubber	Polymerization....	Goodyear Tire & Rubber Co.	Akron, Ohio.....	Cold process polybutadiene developed to eliminate odor in foam rubber cushioning.	Still in pilot plant stage in April 1952.
Reclaimed rubber...	Continuous devulcanization	U. S. Rubber Reclaiming Co.	Cheektowaga, N. Y.	Oxido-plasticization agents reduce devulcanization time.	Plant in operation. Capacity 120,000 lb./day.
Silicone rubber.....	Compounding.....	Connecticut Hard Rubber Co.	.....	Hydrophobic silica reinforces silicone rubber and acts as vulcanizing agent.	Produces very high tensile strength.
Synthetic rubber...	Styrene-less.....	Goodyear Tire & Rubber Co.	Akron, Ohio.....	Process combines vinyl toluene instead of styrene with butadiene; if used generally will save much styrene for plastics.	In experimental commercial production. Vinyl toluene being made by Dow on pilot plant scale.
Synthetic rubber...	Polymerization....	Minnesota Mining & Mfg. Co.	Hastings, Minn..	Fluorine-containing polymer has better cold flexibility, heat stability and ozone resistance.	Limited initial production.

PRODUCT	PROCESS	USER	LOCATION	FEATURES	STATUS AND REMARKS
Rubber (cont.)					
Synthetic rubber	Compounding	Polymer Corp.		Difficult working properties are overcome by oil extension without loss of inherent toughness.	All phases of Alfin rubber production still in development.
Synthetic rubber GR-S	Polymerization	B. F. Goodrich Chemical Co.	Institute, W. Va.	Catalytic mixture contains cumene hydroperoxide, dextrose and TSP. Speeds up production of hot rubber 35 percent.	Perfected by RFC-financed research.
Synthetic rubber GR-S	"Hot" polymerisation			Nitrasole CF catalyst gives abrasion-resistant product at 122 deg. F., eliminates need for refrigeration.	Developed by Firestone Tire & Rubber Co. No plans for immediate use.

MISCELLANEOUS TECHNOLOGY

OPERATION	EQUIPMENT	USER	LOCATION	FEATURES	STATUS AND REMARKS
Coal transport	Pipeline	Pittsburgh Consolidation Coal Co.	Cadiz, Ohio	Slurries of ground coal in water transported more cheaply than rail movement.	Experimental 3-in. line successfully operated. Commercial plans not yet crystallized.
Deionization	Ionic membranes			Synthetic ion exchange membrane continuously separates ionic solutes from two-thirds of hard or seawater feed, discharging solutes in remaining one-third.	Process, developed by Ionics, Inc., is continuously regenerated by electric current. Claimed to operate for 10–20c per 1,000 gal. on seawater, less on brackish waters.
Dewatering	Roll press, floating ring	Consolidated Paper Co.	Wayagemack, Ont.	For soft materials; does not plug. Known as Stacomizer.	Two commercial units now in use after several years experimental development. Machine now made by Farrel Foundry.
Dispersion	Film mill	Various		V-ring rotates in stator with semi-solid feed forced through space between ring and stator under high pressure. Claimed higher dispersion and crystal subdivision than by roller mills and mixers.	Developed by Micro Processing Equipment, Inc. Used for milling soaps and materials of similar consistency.
Distillation	Grid-tray tower	Shell Oil Co., Shell Chemical, others		Distillation tray consisting of parallel grid bars gives 20–100 percent higher column capacity, longer life, lower first cost compared with bubble trays.	Called Turbogrid. Developed by Shell Development Co. Available under license.
Dust recovery	Wet-bottom precipitator	Various		New wet-bottom Cottrell electrostatic precipitators will recover salt cake dust at 90 percent efficiency from 140,000 cfm. of black-ash furnace gases at 275–300 deg. F.	Plants to be completed mid-1953. Black liquor pumped through bottom sump removes collected dust.
Electric power generation	Breeder reactor	Atomic Energy Comm.	Idaho Falls, Idaho	Liquid metal transfers breeder reactor heat to steam generating exchanger, producing steam to drive turbine.	Initial step of experimental stage.
Emulsification	Gallenkamp mixer.			Produces stable emulsions and suspensions by high-speed, razor-edged blades.	Under investigation by several industries.
Extractive crystallization	Crystallizer			Urea and thiourea adducts simplify separation of close-boiling organic compounds. Adduct crystals are filtered, then dissolved in water, destroying the complex.	Research in progress by Shell Oil Co. and others.
Filtration of dusts	Electrostatically charged filter	Various		Self-charging. Uses dielectric properties of polyethylene and other plastics.	Several such filters on market, developed by American Optical and others.
Filtration	Vacuum filters			Iron or aluminum sulphate flocculating followed by slow freezing and thawing improves sewage sludge filterability.	English development.
Fire fighting	Air agitation	Socony-Vacuum Oil Co.	Paulsboro, N. J.	Fire in volatile liquids can be snuffed out or reduced to fightable size by air agitation which will bring cold liquid to top, stop vaporization.	Method, available on royalty-free basis, works on petroleum products, vegetable oils.
Freeze drying	Infra-red, continuous			Liquid frozen as pellets, then dried under vacuum by infra-red on continuous belt. Much faster than batch processes.	Developed by Freeze-Dry Corp. and Proctor & Schwartz for heat-sensitive organics, pharmaceuticals, foods.
Gas-phase reactions	Jet reactor	Various		Developed as a high-velocity fluid fuel burner, jet device gives complete combustion, near-theoretical temperatures, enormous heat release. Has probably important applications for process reactions.	Burner being tried out by various chemical concerns for uses such as synthesis gas production, drying, evaporation, acetylene from natural gas. Developed by Thermal Research & Eng. Corp.
Grinding	Any type			New theory of work in grinding states that work useful in breakage is proportional to square root of diameter of product particles. Permits workable predictions.	Developed by F. C. Bond of Allis-Chalmers, new "Third Theory" displaces Kick and Rittenger theories of grinding work.
Grinding	Conventional	Pedry Process Co.	Elizabeth, N. J.	Grinds at low temp. with liquid N_2.	Developed by Linde Air Products.
Ink drying	Sulphur dichloride contactor	Meyercord Co.	Chicago, Ill.	Speeds drying of inks, paints and varnishes by exposure to sulphur dichloride vapor.	Developed by Armour Research Foundation.
Ion exclusion	Ion exchange column	Dow Chemical Co.	Midland, Mich.	Separates ionic from non-ionic materials. Ordinary ion exchange resins reject ionic material, slow down non-ionic. Periodic water wash removes ionic materials in solution ahead of non-ionic. Cycle then repeats.	Developed by Dow, process is expected to supplement ion exchange in applications where concentration of ionic material is high. Regenerant chemicals not needed. 70 gph. unit operating.
Liquid thermal diffusion	Diffuser	Standard Oil Co. of Ohio	Cleveland, Ohio.	Will separate isomers or materials with same b.p.	In pilot plant stage.
Monitoring gas streams	Mass spectrometer	Various		Adaptation of mass spectrometry to continuous analysis of gas streams.	Full scale experimental use.

Miscellaneous Technology (cont.)

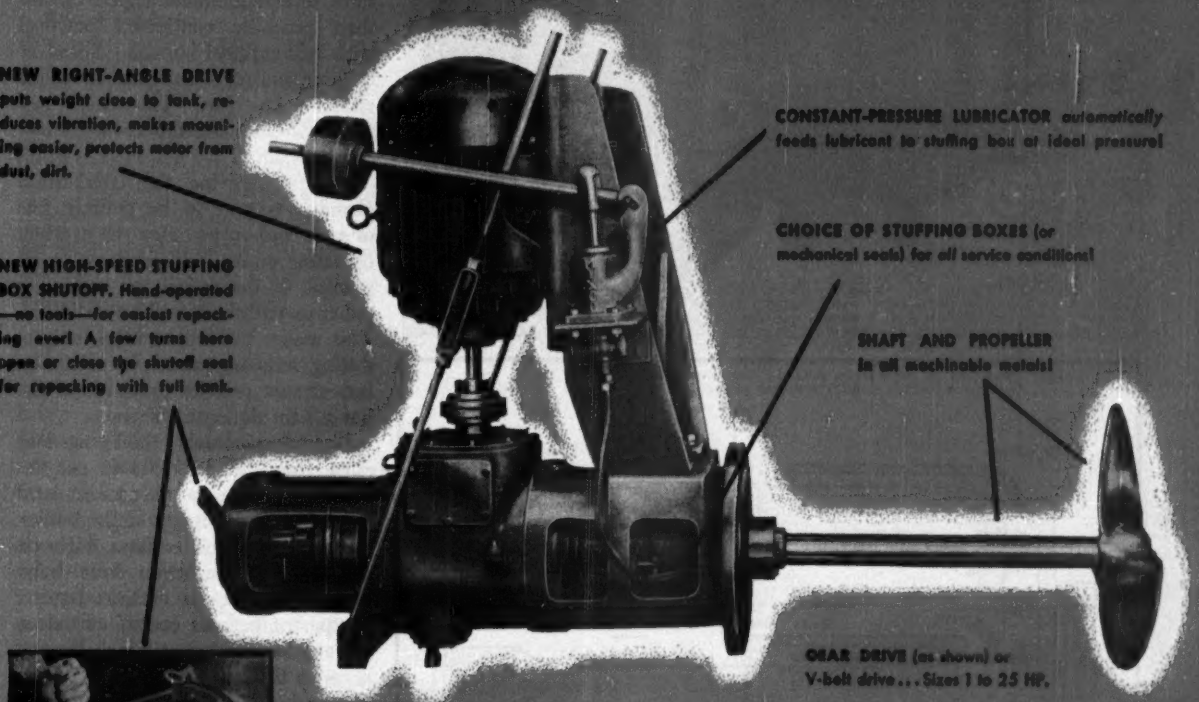
FUME SCRUBBING: Kaiser Aluminum & Chemical Corp., Mead, Wash.

OPERATION	EQUIPMENT	USER	LOCATION	FEATURES	STATUS AND REMARKS
Miscellaneous Technology (cont.)					
Monitoring gas streams	Non-dispersive infrared analyzers	Various		Analyzers of positive and negative filter types, made by several makers, can continuously measure concentration of one component in several.	"Plant stream analyzers" just now becoming popular, chiefly for gas streams, both organic and inorganic. Liquid-stream analysis coming.
Odor control	Catalytic combustion	Sun Oil Co., others	Marcus Hook, Pa.	Porcelain rods coated with alumina—Pt alloy catalyst claimed 90 percent or better efficient in oxidizing organic odors, recovering waste heat.	Developed by E. J. Houdry; marketed by Oxy-Catalyst Mfg. Co. Sun Oil recovering 7,500,000 Btu./hr. from waste 3 percent CO and HC's.
Odor control	Oxidizing tower	Weyerhaeuser Timber Co.	Springfield, Ore.	Odorous sulphide-containing vapors from kraft cooking liquors are oxidised when liquor passes down through a tower co-current to air.	Process treats 300 gpm. black liquor with 3 g. per l. sulphides, using 10 cfm. air/gal. liquor.
Odor control	Spray scrubber	Various		Organic odors destroyed by contact with water spray containing 100–500 ppm. of chlorine as chlorine dioxide.	More effective than chlorine or hypochlorite. Developed by Mathieson Chemical Co.
Power generation	Fuel cell	Pittsburgh Consolidation Coal Co.	Library, Pa.	Converts carbon directly to low-voltage electrical energy, bypassing conventional steam cycle.	Pilot unit under test, economics as yet undetermined. Potential efficiency is 80 percent.
Resisting heat	New refractory			Refractory of silicon carbide bonded with silicon nitride withstands 5,000 deg. F. and 300 psi. for short time in rocket motors.	Called Niafrax; developed by Carborundum Co. Expect similar compositions to have important process uses, e.g., in oil and gas cracking.
Soil compaction	Vibrator	International Minerals & Chemical Corp., others	Mulberry, Fla.	Vibrafloat method, involving intense vibration of soil in presence of water, was pioneered for industrial soil preparation in U. S. by Intminco. On sandy soil compacts soil for foundations at 1/8 cost of piles.	Developed by S. Steuerman, operated by Rust Engineering Co. Mulberry plant, built over 3,350 compacted spots, shows no settlement.
Soil stabilization	Lignin oxidation	Army Engineer Corps		Sulphite liquor reacts with Na or K bichromate to form water-insoluble gel.	Developed by Cornell Univ. Now undergoing application tests by Army.
Thermodynamic concepts				Concept of transmitted energy is suggested to account for discontinuities and instabilities in fluid flow. Significant only at high velocities.	Ideas advanced by Neil P. Bailey, Rensselaer Polytechnic Institute.
Vacuum distilling	Heated-tray still	A. Gross & Co., others	Newark, N. J.	Vacuum still for fatty acids decreases temperature-time exposure by using hollow, Dowtherm-heated bubble tray. Gives higher yield, high product quality.	First unit tried out several years ago. Other installations now going in. Developed by Wurster & Sanger, Inc., Chicago.
Waste disposal	Air flotation unit	Various		Air dissolved under 25 psi. pressure in waste water containing fine solids or immiscible liquids is released, bubbling to surface and carrying contaminants, clarifying water.	Developed by Bulkley, Dunton Processes, Inc. under name of Colloidair.
Waste disposal	Chlorinator	Oldbury Electrochemical Co.	Niagara Falls, N. Y.	Waste water containing phosphorus is treated with chlorine, forming phosphorus trichloride which hydrolyses to acid.	Eliminates hazards in sewage treatment plant.
Waste disposal	Copper chromite catalyst converter	E. I. duPont de Nemours & Co.	Belle, W. Va.	Organic wastes in vapor form are oxidized on chromite or metal oxide catalysts at about 300 deg. C.	In use on mixed vapor of formaldehyde, etc., and on ethylene glycol derivatives.
Waste disposal	Furnace			Calcium-base waste sulphite liquor burned without auxiliary fuel.	Developed at Washington State College.
Waste disposal	Solvent extracter	Ohio Oil Co.	Robinson, Ill.	Hydrocarbon solvent removes phenol from process wastes. Uses Scheibel extractor.	Process worked out in laboratory.
Water treatment	Packed tower	Freeport Sulphur Co.	Bay Ste. Elaine, La.	Amphibious sulphur mining plant uses brackish injection water. Corrosiveness controlled by scrubbing with flue gas to remove oxygen.	Scale deposition is minimized in heating water to 325 deg. in heat exchangers by use of controlled heating conditions.

EASIEST MAINTENANCE EVER!

NEW Lightnin® Mixers

For low-cost blending–mixing–agitating in tanks up to 5 million gallons



NEW RIGHT-ANGLE DRIVE puts weight close to tank, reduces vibration, makes mounting easier, protects motor from dust, dirt.

NEW HIGH-SPEED STUFFING BOX SHUTOFF. Hand-operated—no tools—for easiest repacking ever! A few turns here open or close the shutoff seal for repacking with full tank.

CONSTANT-PRESSURE LUBRICATOR automatically feeds lubricant to stuffing box at ideal pressure!

CHOICE OF STUFFING BOXES (or mechanical seals) for all service conditions!

SHAFT AND PROPELLER in all machinable metals!

GEAR DRIVE (as shown) or V-belt drive... Sizes 1 to 25 HP.

GUARANTEED TO DO THE JOB—AND DO IT RIGHT—OR YOUR MONEY BACK!

FOR PARTICULARS, call your MIXCO representative, or write us today.

for every fluid mixing job

MIXCO

fluid mixing specialists

EVERY *LIGHTNIN* MIXER IS GUARANTEED TO DO THE JOB *RIGHT*

PORTABLE
½ to 3 HP

SIDE ENTERING
1 to 25 HP

TOP ENTERING
¼ to 500 HP

MIXING EQUIPMENT Co., Inc.

128 Mt. Read Blvd., Rochester 11, N. Y.

In Canada: William & J. G. Greey, Ltd., Toronto

Please send me the bulletins checked:

- ☐ B-102 Top Entering Mixers (turbine and paddle types)
- ☐ B-100 Condensed Catalog (complete line)
- ☐ B-103 Top Entering Mixers (propeller type)
- ☐ B-75 Portable Mixers (electric and air driven)
- ☐ B-104 Side Entering Mixers
- ☐ DH-50 Laboratory Mixers

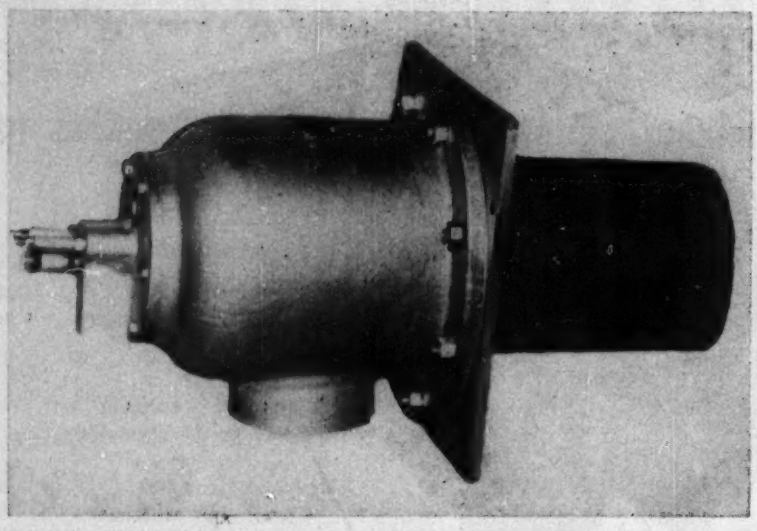
Name.....

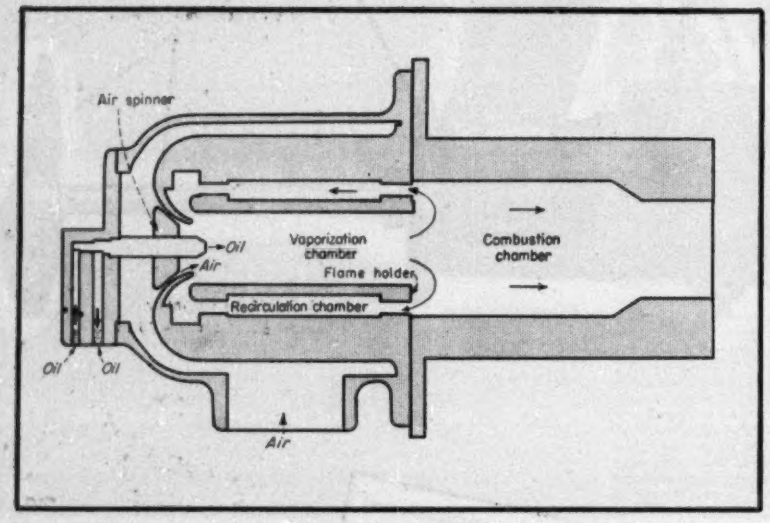
Title.....

Company.....

Address.....

City.....Zone....State.....





Burner Reflects New Theory

Combustion lessons learned in jet engine developments have been applied to a new burner design. Result is very high heat release per unit of combustion volume.

To the ancients fire was elemental, but to the modern engineer combustion techniques are by no means a closed book. One of the newest pages in that book concerns a unique oil burner design.

Combustion information gleaned from jet engine developments provided background for the design of the Thermal high velocity burner. Outstanding among its characteristics are very high heat release per cubic foot of combustion volume, carbon-free combustion products and high discharge velocity of the hot gas. (See *Chementator*, Dec. 1952 p. 104.)

In turn these characteristics produce some rather unusual results. Combustion chamber volume is greatly reduced because burning is completed with extreme speed. This speed together with a non-luminescent flame and near stoichiometric fuel-air ratios produce combustion gas temperatures several hundred degrees higher than generally considered practical with conventional burners. Speed of burning and non-luminescence reduce radiation heat loss. Theoretical fuel-air ratios eliminate the cooling effect of excess air.

Hot gas leaving the combustion chamber is said to be entirely free of sooty carbon particles. Even when operating on air reduced down to 70 percent of theoretical the carbon is either partially or completely oxidized. This makes the burner ideal for producing reducing atmospheres. Also lack of soot permits direct use of the hot gas for drying applications.

Gas velocity leaving the burner may range from 300 to 1,000 ft. per sec. depending upon the air pressure used and the internal design of the burner. These high velocities favor high coefficients of convection heat transfer. Proper design of heat transfer equipment permits control of velocities and temperatures through the passages so that uniform heat transfer is obtained. Actually the transfer of heat can be governed by fluid flow laws.

Use of the Thermal burner with a high heat release fire tube boiler and a high heat release gas heat exchanger has resulted in heat transfer rates of 28,000 and 19,000 Btu. per sq. ft. per hr. respectively. Both of these units have operated over 1,000 hr.

What gives this oil burner the ability to come up with such outstanding performance records? Part of the answer lies in completely vaporizing the fuel oil prior to burning. Proper design of the flame holder and combustion chamber to most efficiently burn the vapor completes the answer.

A simplified schematic drawing pictured above helps to visualize the essentials of the burner and how it works. Mounted in one end of the barrel-like assembly are an air nozzle and a standard pressure atomizing nozzle for injecting the fuel oil.

Entering air at 1 psi. is preheated

Equipment Cost Indexes

(Marshall & Stevens Indexes, 1926 = 100)

Industry	Sept. 1951	June 1952	Sept. 1952
Average of all	179.1	180.3	180.5
Process Industries			
Cement mfg.	171.5	172.6	172.7
Chemical	179.5	181.0	181.1
Clay products	166.5	167.6	167.7
Glass mfg.	169.6	170.7	171.1
Paint mfg.	172.8	174.3	174.4
Paper mfg.	173.1	174.6	174.7
Petroleum ind.	175.9	177.4	177.8
Rubber ind.	178.3	179.8	180.2
Process ind. avg....	176.9	178.4	178.6
Related Industries			
Elec. power equip...	181.1	182.6	183.0
Mining, milling	180.2	181.7	182.1
Refrigerating	198.6	200.5	200.9
Steam power	168.7	170.3	170.7

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1952, p. 191.

within an annular passage surrounding the vaporization section. As the preheated air and atomized oil enter through their respective nozzles they mingle with hot combustion gases from the recirculation chamber.

These gases keep the vaporization zone hot and completely vaporize the oil droplets.

No burning takes place in the vaporization zone since the mixture velocity is higher than the velocity of flame propagation. Burning starts at the flame holder and progresses inward to the center of the combustion tube at the downstream point. Combusion occurs at this position in the tube because there is a sudden increase in barrel diameter which drops mixture velocity below flame propagation velocity.

Hot combustion gases, recirculating for vaporization purposes, follow a path back through perforations in the flame holder into the annular space surrounding the vaporization zone. Entrance to the vaporization tube is through an opening close to the throat of the air nozzle. Low pressure at this point actuates the recirculation flow.

The burner is equipped with standard ignition and flame control. A 3 to 1 turndown provides flexible control of burning.

Any of the common distillate types of oil can be used as fuel. Extensive work is underway to develop a suitable design for burning residual oils including the bunker types. The current design can be used interchangeably with either gas or oil. Gas ranging from 300 to 2,500 Btu. per cu. ft. can be burned without any modification.

Heat release by the Thermal burner covers a range from 1 to 10 million Btu. per hr. per cu. ft. of combustion volume. Now available are three basic sizes with outputs of 50 thousand to 3.5 million Btu. per hr. The over-all dimensions of the largest unit including the combustion chamber are 9.5 in. dia. by 32 in. long.—*Thermal Research & Engineering Corp., Mill Road, Conshocken, Pa.*

IN BRIEF—A capsulated listing of this month's newsworthy equipment.

		Page
Heating & Cooling Equipment		
Oil and Gas Burner	Completely atomizes fuel for high efficiency	208
Pipe Anchor	Lowers heat loss and electrolysis underground	209
Vermiculite Firebrick	Has very low thermal conductivity	209
Packaging & Handling Equipment		
Loading Ramp	Gives electrical adjustment to proper height	210
Belt Feeder	Maintains pre-set feed rate	210
Fork Truck	Designed for short turning radius	210
Conveyor Belt	Provides running weight record	210
Fibre Pallets	Are strong, light weight and expendable	210
Hopper-Car Trailer	Used for delivering catalyst to refinery	210
Fluids Handling Equipment		
Rotary Pump	Has high efficiency, good wear resistance	212
Line Coupler	For large lines, has built-in shut-off	212
Line Coupler	Provides automatic shut-off for liquid, gas	214
Displacement Pump	Operates on compressed air, has no glands	214
Control Valve	Throttles high pressure flows	214
Centrifugal Pump	Uses special impellor to protect glands	214
Industrial Meter	Made of stainless steel for corrosives	214
Electrical & Mechanical Equipment		
Explosion-Proof Starter	Offers many new features for greater flexibility	216
Waterproof Switch	Is very rugged and sealed from dirt, moisture	216
Transformer	Is completely enclosed dry distribution type	216
Battery Caps	Contain catalyst to liquify escaping gases	216
Acetylene Regulator	Feeds steady pressure to torch	216
Variable Speed Motor	In fractional hp. size has wide speed range	216
Spray Gun	Operates on CO_2 cartridge, is self contained	218
Spraying Rig	Charges paint particles within gun	218
Instruments & Controls		
Flash Point Tester	Performs test automatically in 2½ min.	220
Vibration Tester	Fits in pocket, locates vibration sources	222
Truck Scales	Utilize strain gages and electronic circuits	224
Flowmeter	Warns of excess flow rates	224
Pressure Transmitter	Used on control systems, transmits electric signal	226
Optical Pyrometer	Measures up to 3,300 deg. F., fits in pocket	226

Underground Pipe Anchor Reduces Heat Loss

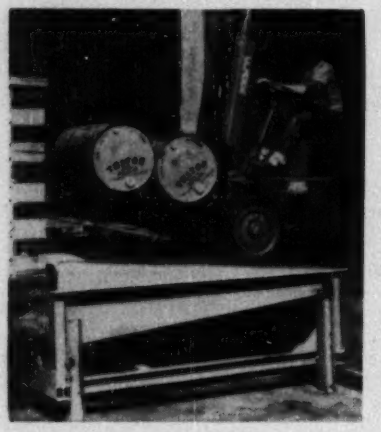
A new type of insulated anchor for underground, insulated pipe reduces heat loss and eliminates electrolysis. Sheet Transite insulates anchor from pipeline.—*Durant Insulated Pipe Co., Warren Way & Bay Road, Palo Alto, Calif.*

Vermiculite Firebrick Reduces Heat Loss

A new insulating firebrick made of vermiculite with clay binders is said to increase furnace efficiency and to reduce operating cost. The micaceous mineral vermiculite has extremely low thermal conductivity, thereby providing the efficient insulating quality of the brick.

Vermiculite firebrick has high resistance to cracking caused by impact or thermal shock. Physical and chemical stability are good below the normal service limit of 1,800 deg. F. These bricks are easily sawed and fitted without breakage. Brick is made in standard 9-in. series, 25 to a carton.

The brick is designed primarily as back-up insulation for refractory brick in the service range up to 1,800 deg. F. When not subject to mechanical abrasion or exposed to molten slag or metal, however, it can be used as facing brick when temperatures are not higher than 1,800 deg. F.—*Zonolite Co., 135 South La Salle St., Chicago, Ill.*



Loading Ramp
Adjusts to Proper Height

This electrically operated loading ramp has deck adjustment over 24 in. of height to facilitate transfer of goods between truck bed and unloading dock. Since the use of this device permits free unobstructed movement by normal materials handling equipment such as fork trucks there is no need to tie up labor to move materials from one level to another. The loading ramp is merely adjusted to the proper height and unloading can proceed normally.

Level adjustment can be done either manually or by power from a 110-v. electric motor direct connected to a 350 lb. Viking hydraulic pump.—*John B. Illo Co., 2414 E. 57th St., Los Angeles 58, Calif.*

Solids Belt Feeder
Maintains Preset Rate

A newly designed belt feeder transports, weighs and maintains a preset rate of feed for any finely divided solid material. Accuracy of 99¼ percent or better is claimed for weighing, totalizing and regulating feed, regardless of belt speed or tonnage variations. Feed rate range is 10 to 24 tons per hour.

The weight integrator controlling the unit is completely mechanical and does not require pneumatic or electrical connections for operation. An even feed to the belt is assured by two helical screw conveyors mounted over each other above the belt. Material feeds out of a hopper into the top conveyor rotating at 12 to 36 rpm., depending upon the preset feed rate. This conveyor discharges into the bottom screw conveyor which operates three times as fast, thereby assuring a steady even feed to the weighing belt.—*Sintering Machinery Corp., Transportometer Div., 301 Sinter Ave., Netcong, N. J.*

Fork Truck
Has Short Turning Radius

Apparently there is continual demand for lift trucks capable of turning in smaller areas. Model A-3444 rated at 3,000 lb. capacity is a recent answer to this demand. This unit is able to perform right angle stacking in a 10-ft. aisle with a 48-in. long load.

Other features include double-reduction unit drive assembly, compensating controlled-caster type steering axle, automotive-wheel type steering control, foot control of travel acceleration, and a hydraulic hoist system with patented balanced cross suspension of load.—*Mercury Mfg. Co., 4044 South Halsted St., Chicago 9, Ill.*

Conveyor Belt System
Gives Running Record

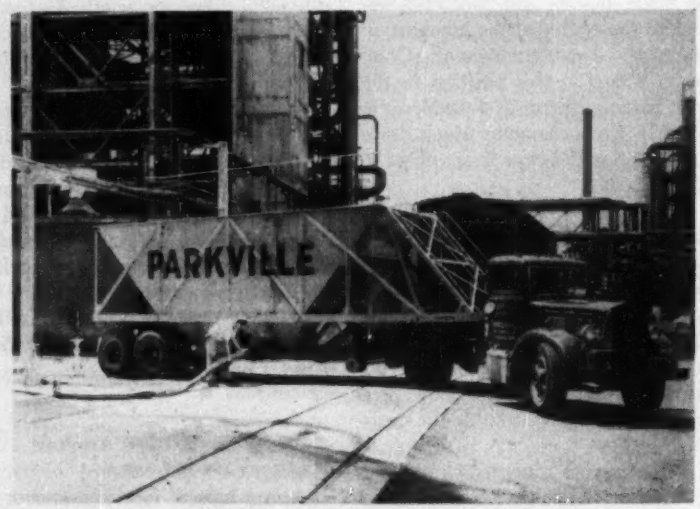
A running record of conveyor belt delivery to one or more points is provided by a new weighing system. Where one large belt supplies several other belts at different places along its length, the system adds and subtracts to measure the quantity supplied to any or all belts. It is said the system can also control blending of several different materials on the belt.

Continuous weighing of material being carried by the belt provides running tonnage measurements, as well as total tonnage delivered over a period of time. Measurements can be transmitted over considerable distance to an automatic chart recorder.—*Trans-Weigh Co., Wayne, Pa.*

Fibre Pallets
Are Expendable

A new strong, lightweight fibre pallet has recently been placed on the market. Constructed of honeycomb material faced on either side with heavy kraft, the pallets are made single faced, single faced with reinforcements on the bottom and double faced, in all standard sizes. Special sizes are available on order.

Originally intended to be expendable, this economical pallet can be used several times and affords a great reduction in physical labor, it is said. It also helps to speed packaging and expedites the handling and storage of material.—*Fiber-Weld Corp., 151 East Venago St., Philadelphia, Pa.*



HOPPER-CAR TRAILER DELIVERS PETROLEUM CATALYST

Catalyst from Davison's Curtis Bay plant in Baltimore is delivered to the Esso Standard Oil refinery in the same city by a hopper type trailer. The 34,000 lb. net load is unloaded by vacuum at a rate of 11,000 lb. per hr. Savings in delivery time, manpower and materials are realized.—Warner Fruehauf Trailer Co., 10941 Harper Ave., Detroit, Mich.

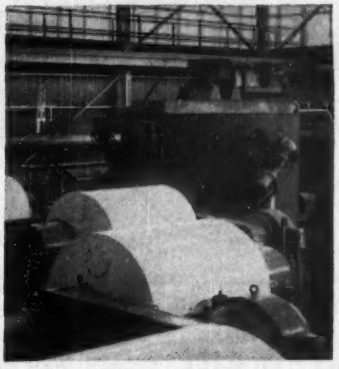
Turbo-Topics

TURBO-MIXER GENERAL AMERICAN TRADE MARK

TURBO-MIXER, a division of

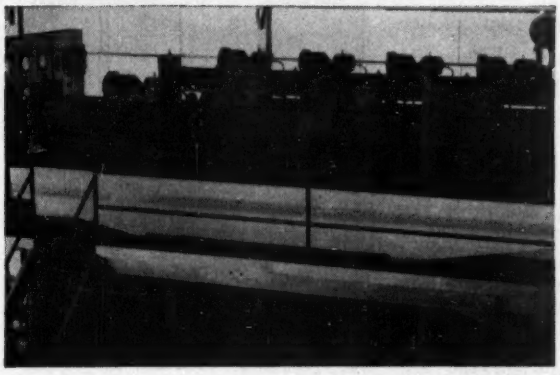
GENERAL AMERICAN TRANSPORTATION CORPORATION

TURBO INSTALLATION at Duval Potash Refinery



Left: *Turbo Slurry Mixers suspending ground potash ore*

Below: *Turbo-Floaters separating ground potash slurry in the roughing and cleaning circuits*



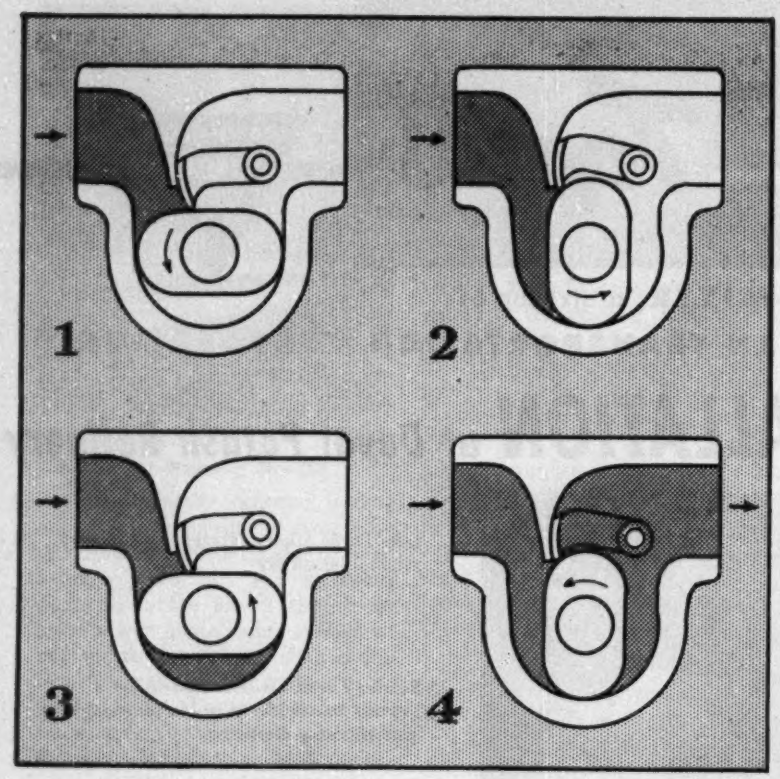
The modern Duval Sulphur & Potash Company plant recently opened at Carlsbad, New Mexico uses Turbo-Mixers exclusively in the refining operations. The Turbo-Mixers handle the major slurry suspension operations before and after flotation. The Turbo Floaters for the froth flotation of the potash ore are similar to the Turbo Floaters in the service of other refineries in the Carlsbad field.

Here is another example where an industrial leader called upon Turbo-Mixer to supply creative mixing devices for continuous duty—24 hours a day—every day. Call on Turbo for specialized help in supplying controlled agitation for optimum results.

SALES OFFICE: 10 EAST 49th STREET, NEW YORK 17, NEW YORK

General Offices: 135 South La Salle Street, Chicago 90, Illinois • Offices in all principal cities

OTHER GENERAL AMERICAN EQUIPMENT:— DRYERS • EVAPORATORS • DEWATERERS TOWERS • TANKS • BINS • FILTERS • PRESSURE VESSELS



Rotary Pump Resists Wear

Design favors use of resistant material at most likely wear point. Non-pulsating flow, high efficiency, low slip and good solids handling ability are added features.

The Rotorarm pump is a new positive displacement unit that shows promise of fitting into a number of pumping jobs where older designs fail to perform well. Aimed at giving good rotary pump performance on tough chemical jobs the Rotorarm is claimed to have low maintenance requirements.

Pumping action is provided by two double-lobe rotors set at 90 deg. on a single shaft and separated by a circular plate. These rotors revolve in a chamber below the inlet and discharge openings. Located above this chamber between inlet and outlet ports is a metal partition which divides the suction and discharge sides of the pump.

As the rotor turns the ends of the lobes pass in close clearance with the bottom of the dividing partition. Once a lobe passes this point a gap opens up which must be sealed off. To serve this function a spring loaded hinged arm slides up and down the partition maintaining constant contact with the revolving lobe.

Spring tension on the arms is only partially responsible for the good sealing action obtained. Actually it is said increased pressure on the discharge keeps the arms riding tightly on the rotor lobes. Such action keeps slip at a minimum as pressure rises.

A film of liquid always separates the arm tip and the lobe surface. The rotors may be hard faced or protected by abrasion resistant synthetic rubber. Tantung metal is used on the tips of the sealing arms. Balance of the construction can be either Ni-Resist or 316 stainless steel.

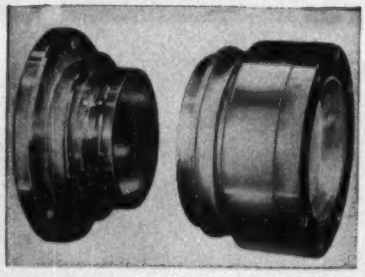
The rotating shaft can be furnished with either inboard or outboard bearings and either mechanical or gland seals. Limit on operating pressure is 75 psi. when outboard bearings are used.

The Rotorarm pump will work against discharge pressures up to 200 psi. Output versus pressure is said to remain relatively constant. On the suction side the pump will pull 28 in. of vacuum. Mechanical efficiency runs as high as 80 percent.

A wide range of viscosities can be satisfactorily handled with this unit. Gasoline, peanut butter, corn sirup and high viscosity nitrocellulose have all been pumped equally well.

Slurries can be pumped with minimum particle degradation and parts abrasion. A notable example of this has been the pumping of an 80 percent slurry of ammonium thiocyanate without appreciable degradation.

Rotorarm pumps are available in three sizes. The smallest size for 1 to 10 gpm. runs up to 1,800 rpm. Top speed for the 3 to 30 gpm. unit is 1,200 rpm. The pump for the 6 to 60 gpm. range has a top speed of 900 rpm. *Hinckley Corp., Chemical Pump Div., 264 Arlington St., Watertown 72, Mass.*



Large Line Coupler Has Built-In Shutoff

A recent addition to the line of Snap-Tite couplers is a coupler for 8-in. pipelines. The unit can be supplied either with or without a valve in the coupler body to automatically shut off liquid flow when the male part or nipple is removed. Standard flanged connections are provided and a choice of construction materials is available.

The quick connect feature eliminates the necessity of having a maintenance man, with tools, available for connecting or disconnecting. Any operator can make or break a connection by merely sliding a sleeve on the coupler. The device works equally

NEW ACE PARIAN® chemical piping

TOUGH •
ODORLESS •
NON-TOXIC •

PHYSICAL CHARACTERISTICS:

Specific Gravity — 1.12
Tensile Strength — 2000 psi
Resistance to Cold Flow — Excellent
Deformation Under Load at 122°F — 0.6%
Impact Strength — Izod 32 ft. lbs./in. notch
Resistance to Continuous Heat, no load — 212°F
Low-Load Heat Distortion Temp. — 105-110°F
Coeff. Thermal Expansion/Deg. F — 9×10^{-5}
Resistance to Sunlight — Excellent
Water Absorption — 0.04-0.06%
Elongation — 100-200%

No other chemical piping offers such a remarkable combination of chemical resistance, high impact strength, and easy workability as new ACE Parian. Formed of Polyethylene with all the skill of American Hard Rubber Company's 101 years of specialized experience, it is ideal wherever both the interior and exterior of the pipe are exposed to corrosion. Odorless and non-toxic, it's also good for foods and beverages.

All standard pipe sizes from ½" to 2". Standard lengths of 10 feet. It's easy to thread with standard dies, and a complete line of molded Ace Parian fittings are available.

Why not glance over the physical characteristics and specific reagents at right, and see how many places in your plant this new pipe can save for you!

chemical resistance at 77 deg. F.

EXCELLENT:
Sulfuric Acid, 10-30%
Calcium Chloride, 15% aq.
Calcium Hypochlorite
"Duponol" ME, 10% aq.
Triethanolamine
Ferric Sulfate, 15% aq.
Saturated Salt Water

GOOD:
Sulfuric Acid, 60% — concentrated
Hydrochloric Acid, conc. (10-37%)
Sodium Hydroxide, 10-50%
Ethyl Alcohol (denatured)
Acetone
Formic Acid
Hydrofluoric Acid, 48%

FAIR:
Nitric Acid, 10%
Acetic Acid, 10%
Ammonium Hydroxide, 10-28%
Dioxane
Xylene
Sodium Bisulfite
Linseed Oil

POOR:
Benzene
Ethylene Dichloride
Butyraldehyde

UNSUITABLE:
Nitric Acid (Conc. 70%)
Acetic Acid, glacial
Oleic Acid, conc.
Most Chlorinated solvents
Lubricating Oil
Ethyl Acetate

Parian is only one of many ACE rubber and plastic products serving the chemical industry. Tanks, pumps, piping, valves, fittings are available in standard or special constructions for complete chemical processing, storage or circulating systems. Ask our engineers to recommend the most economical corrosion-resistant equipment for your processes.

ACE rubber and plastic products

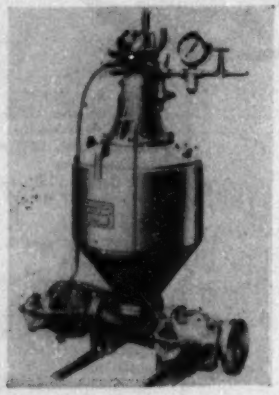
AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.

well on lines handling liquid, air, gas, or vacuum.—*Snap-Tite, Inc., Union City, Pa.*

Line Coupler
Has Built-In Valve

Automatic positive shut-off of liquid and gas in lines during coupling or uncoupling operations is provided by a new make and break double shut-off valve coupler. Each half of the coupling unit contains a piston valve which is always closed except when the two halves of the coupling are connected together. At that time the piston valves open, permitting free flow of material through the closed coupling.

These couplings are available in ½-in. F.P.T. connections. Protector caps are provided for covering coupler halves when disconnected.—*Henry Valve Co., 3215 North Ave., Melrose Park, Ill.*

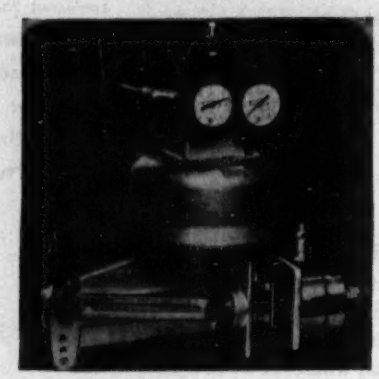


Displacement Pump
Uses Compressed Air

A new displacement pump operates on compressed air and has no rotating or reciprocating parts. Called the Ejectopump, the unit operates automatically when connected to any compressed air supply line and pumps liquids in a series of regular suction and discharge strokes. It is said the Ejectopump has a suction lift of 10 ft., thereby permitting location above the level of the liquid to be pumped. There are no bearings, glands, or revolving shaft. Among the liquids which can be handled are a variety of food products, paints, lacquers, varnishes, oils, solvents, milk of lime, and abrasive slurries.

The Ejectopump consists of a cylindrical casing, a float and two return valves in contact with the liquid, and a header mounted above the casing which is never in contact with the liquid. Housed in the header are pneumatic valves and an air-operated ejector which is in operation during the suction stroke only. Rate of air admission to the casing is adjustable and output can be controlled to give any desired pumping rate. Operating on compressed air at 30 to 50 psi., the pump will handle discharge heads up to 50 ft.

Normal construction is steel and cast iron. However, for special applications, the pump can be furnished in monel, inconel, or stainless steel. Available sizes are 1½, 2, 3, 4 and 6 in. —*Ferro Corp., 4150 East 56th St., Cleveland 5, Ohio.*



Control Valve
Throttles High Pressure

A new low-flow pneumatically controlled valve is available for working pressure ranges of 10,000 and 30,000 psi. The unit which is specifically adapted to pilot plant operation is also available, with special assemblies, for operation up to 50,000 psi. Sizes range from ⅛ through ¼ in. with screw, welding, super-pressure and autoclave end connections available.

The Domotor piston actuated operator combined with a unique multiplying mechanism develops thrust forces up to 6,000 lb. This assures positive and accurate positioning of the valve plug against the extreme forces of off balance and packing friction which develop in high-pressure systems.

A simple combination of four interchangeable plugs and two seat rings provides a C_v selection of values from 0.0016 to 1.00. The valve is available in a wide variety of alloys. —*Annin Co., Union Pacific & Spence, Los Angeles 23, Calif.*

Special Impeller
Protects Shaft Glands

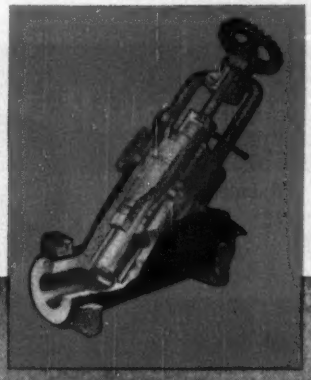
A new line of centrifugal pumps for handling slurries and acids features an impeller design said to protect the shaft and packing from damage. Small auxiliary vanes on the back of the impeller disk produce a vacuum on the shaft seal and prevent solids from cutting the shaft or packing. This eliminates the need for sealing water.

Vacseal pumps are especially applicable to service in the chemical industry for pumping acids, alkaline pulp, suspended solids, and many other hard to handle materials. All metal pumps are constructed of Ferloy iron. Rubber, neoprene and silicone rubber are available as pump lining material. The pump can be made acid-proof merely by changing the gland bushing and installing a shaft sleeve.—*The Galigher Co., 545 West Eighth South, Salt Lake City, Utah.*

Industrial Meter
Handles Corrosive Liquids

The new 2 BC Rotocycle stainless steel industrial meter is designed to handle corrosive liquids commonly found throughout American industry. This rotary displacement meter has a maximum capacity of 100 gpm. at a working pressure of 125 psi. All parts in contact with corrosive liquids are constructed of stainless steel.

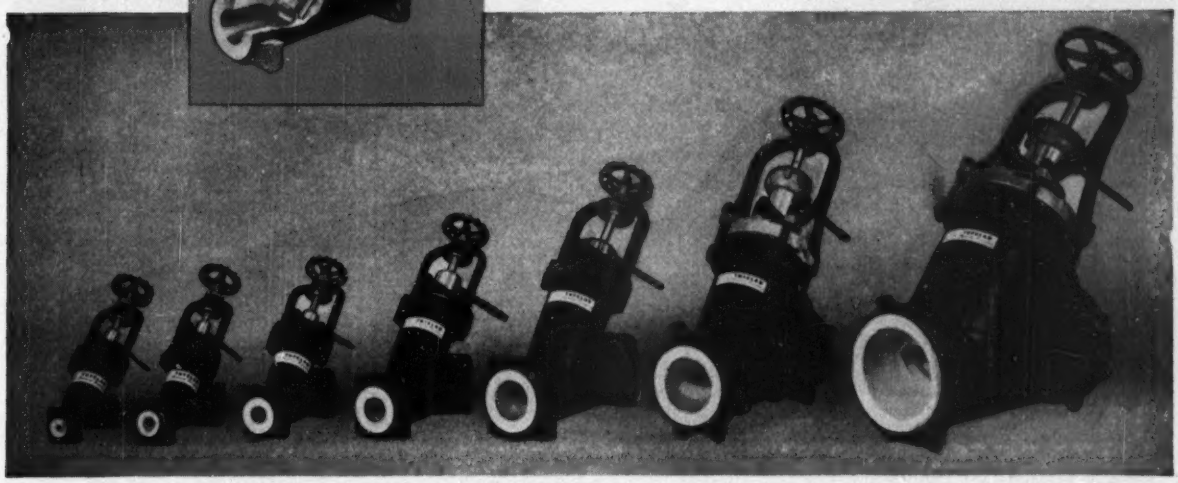
Remote registration provides for transferring the meter reading by electrical impulses to a central control room. A quantity control register has a built-in electric switch that is actuated after a predetermined volume of liquid has passed through the meter. Total weight, exclusive of registering accessories, is 120 lb.—*Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa.*



PRIMARY PROTECTION FOR

PERSONNEL . . . EQUIPMENT . . .

PRODUCT . . .



Lapp TUFCLAD

SOLID Chemical Porcelain ARMORED with Fiberglass-Reinforced Plastic

Y-Valves, as shown, and Angle Valves are available in Lapp TUFCLAD Chemical Porcelain in ½", 1", 1½", 2", 3", 4" and 6" sizes. Also safety valves, flush valves, plug cocks, pipe and fittings (to 8" dia.) and special shapes.

What's your first worry in case of minor fire or explosion or accident? You can get a big one off your mind with installation of Lapp Chemical Porcelain with TUFCLAD Fiberglass-reinforced plastic. Without special construction for protection, you have all the advantages of a solid porcelain system with extra security for personnel, equipment and product.

TUFCLAD provides a cushion to protect porcelain against accidental damage in handling or operation—and as insulator against thermal shock. And the TUFCLAD shell is of itself *tough*—fully able to hold operating pressures against gross leakage even though porcelain is damaged by accident, explosion or fire.

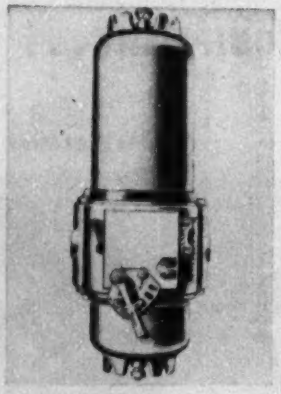
WRITE for description and specifications. Lapp Insulator Co., Inc., Process Equipment Division, 518 Maple St., Le Roy, N. Y.

Lapp

PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS

PULSAFEEDER CHEMICAL PROPORTIONING PUMPS



Explosion-Proof Starter Has New Features

Model M52 explosion-proof line starter and circuit breaker enclosure is said to be the most flexible housing ever produced. The new features include built-in pushbutton stations, built-in selector switches, additional back conduit entrance, additional horizontal through-feed conduit entrances, new and improved reset mechanism, neoprene gasket for protection of upper cover joint and increased wiring space.

Threaded joint construction throughout results in maximum safety, ease of maintenance, inspection and corrosion protection. High density aluminum alloy castings and sectionalized construction permit easy installation of even Size 4 starters.

Type EPC Condulets are available for all sizes of line starters and combinations up to Size 4. Also, they are available for circuit breakers alone up to 600 amp.—*Crouse-Hinds Co., Syracuse 1, N. Y.*

Waterproof Switch Resists Physical Shocks

A new type waterproof switch features an unusual contact mechanism. This mechanism consists of a flat strip of beryllium copper punched out into the shape of a sine curve. This strip is stressed longitudinally causing the two loops of the sine curve to form themselves into opposite helixes. The resultant contact mechanism possesses outstanding ability to resist physical shock.

The switch mechanism is enclosed in a silicone cover completely sealing it from dirt and moisture, as well as making it explosive-proof and waterproof. The switch is available in several styles including single-pole single-throw or double-pole double-throw toggle and push-button types of mechanism. — *Control Products Inc., Harrison, N. J.*

Transformer Is Totally Enclosed

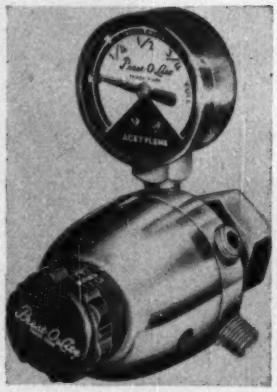
The new Type E completely enclosed non-ventilated dry-type distribution transformer supersedes Type AJR. This transformer, rated 600 v. and below, is available in ratings from 3 to 50 kva.

Hipersil cores and class H silicone insulation are utilized in the transformer which operates at 120 deg. C. rise. Both high- and low-voltage leads are brought to Micarta-laminated, plastic terminal boards at the case bottom. Since the terminal compartment temperature is less than 30 deg. C., standard insulated cables can be used for wiring through the conduit. Conduit knockouts are located at the bottom of the case wall.—*Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.*

Battery Gases Are Captured by Catalysts

Hydrogen and oxygen gas escaping from storage batteries are captured by the Hydrocap and returned to the battery as water. A palladium catalyst located inside the cap performs this recovery trick. By performing this function, the Hydrocap maintains water in the battery at a safe level eight times longer than previously possible.

If the normally-warm cap becomes either hot or cold it serves as an indication either of overcharging or a dead cell.—*Industrial Research, Inc., 4016 Northwest 29th St., Miami 42, Fla.*



Acetylene Regulator Feeds Steady Pressure

The Prest-O-Lite R-411 acetylene regulator is designed to provide the most efficient use of any air-acetylene torch or appliance. Once the regulator is set for a given job it automatically delivers acetylene at precisely correct working pressure—regardless of the amount of gas in the tank.

Acetylene at pressures up to 13 psi. can be delivered through this regulator. There is no need for frequent pressure adjustment and gas is saved since excessive pressure is never used or wasted.

A pressure gage indicates tank content. Lettered graduations are imprinted on the shank of the adjusting screw. This makes it easy to duplicate settings for use on similar jobs. —*Linde Air Products Co., 30 East 42nd St., New York 17, N. Y.*

Electronic Control Varies Small Motor Speed

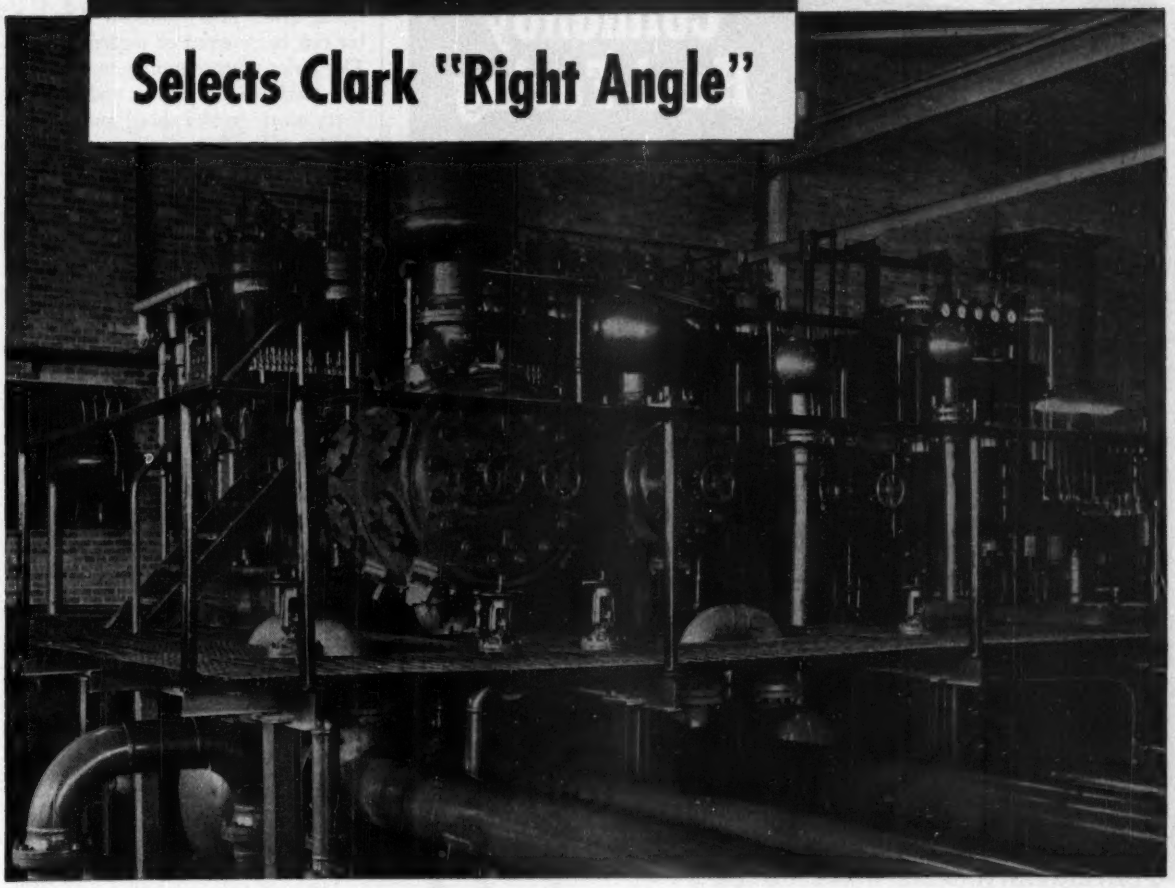
A new, packaged, electric drive unit furnishes variable speed control for fractional horsepower requirements. Consisting of a selector switch, an electronic variable speed unit, and a series motor, the drive provides a stepless range of speeds from 100 to 3,500 rpm. Optional dual range covers speeds from 35 to 3,500 rpm.

Outstanding features include extra high speeds at medium torque and extra high starting torque at slow speed. Acceleration is rapid to preset speeds. Control features include dynamic motor breaking. Speeds are held substantially constant with varying loads.

Operating from 230-v., 60-cycle a.c. current, the single tube electronic unit rectifies the current to d.c. This

New Houston Oxygen Co. Plant

Selects Clark "Right Angle"



Major Industries supplied by World's first oxygen pipeline

Now, for the first time, large industrial plants are being supplied with oxygen via pipeline. A 3-inch, 3-mile line from the Houston Oxygen Company's new oxygen rectification plant has eliminated the hazards and high costs of handling individual tanks.

Playing the key role in the oxygen manufacturing process is an 1100 bhp, HSRA-8, Clark "Right Angle," Gas-Engine-Driven Compressor. Its versatility enables boosting air to 2350 psi in five stages of compression, using a single unit. Both initial costs and operating costs have thus been substantially reduced over a "two-unit train-type" installation.

© 1953, Clark Bros. Co., Division of Dresser Operations, Inc.

Whether your processing application is simple or complex, you can *always* depend on Clark for the right type of compressor. Clark builds *all* types.

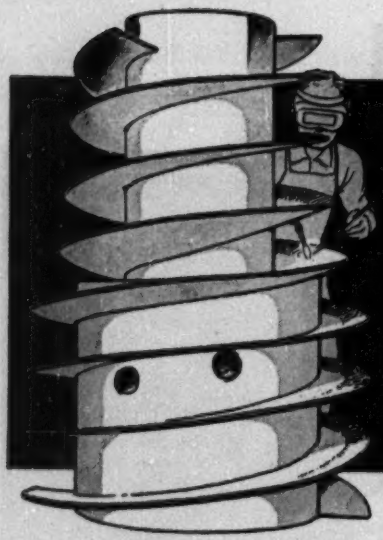
CLARK BROS. CO., OLEAN, N. Y.
Division of Dresser Operations, Inc.
Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON . . .

CLARK

compressors

MOTOR DRIVEN • GAS, STEAM OR DIESEL ENGINE DRIVEN • CENTRIFUGAL • AXIAL FLOW



Colmonoy Hard-Facing *resists* Corrosion, Abrasion

Screw conveyor

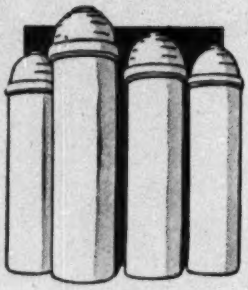
COLMONOY hard-facing alloys protect parts under severe wearing conditions throughout industry. . . . at a cost many times lower than would be incurred by frequent replacements.

SCREW CONVEYOR, shown above, is an excellent example of protecting critical areas to save an entire part. COLMONOY No. 6, an extremely corrosion and abrasion resistant nickel alloy, was used. It is the easiest of all hard-facing rods to apply. Service life of the entire part is greatly extended.

AUTOMATIC VALVE STEMS are typical of an endless number of cylindrical parts that can be hard-faced easily and economically with the COLMONOY Spraywelder. In Spraywelding the alloy is sprayed on and then fused, to form a smooth welded overlay. COLMONOY Nos. 4, 5 and 6 are all available as Sprayweld powders.

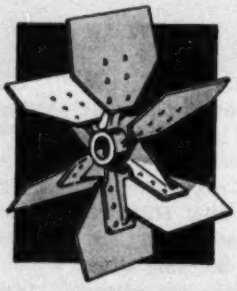
PULVERIZER HAMMERS are an example of what COLMONOY No. 1 was designed to do: protect 'rough' parts against abrasion and impact. Applied by arc welding.

DUST COLLECTOR FAN BLADES are protected from abrasion by COLMONOY Sweat-on Paste. It was applied with a spatula and then fused by carbon arc welding.

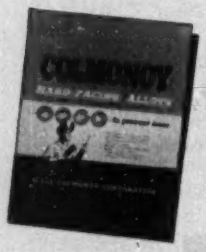


Automatic valve stems

Pulverizer hammers



Dust collector fan



The applications mentioned above are but a few out of the hundreds that have proved the value of Colmonoy alloys in extending equipment service life.
Write for Colmonoy Hard-Facing Manual No. 77; also Engineering Data Sheet No. 3 which shows how Colmonoy alloys protect against the various sources of corrosion.

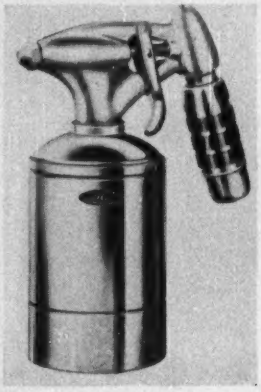
HARD-FACING ALLOYS

19345 JOHN R STREET **WALL COLMONOY** DETROIT 3, MICHIGAN
CORPORATION

BRANCHES: BIRMINGHAM • BUFFALO • CHICAGO • HOUSTON
NEW YORK • LOS ANGELES • PITTSBURGH • MONTREAL

EQUIPMENT NEWS, cont. . .

output is fed into a fractional horsepower series motor rather than a shunt motor used in all other electronic drives now available. The motor can be reversed or jogged at ease. The series motor requires far less current than a shunt motor and also delivers much greater speed and torque. —*The Arrow-Hart & Hegeman Electric Co., Industrial Control Div., 103 Hawthorn St., Hartford 6, Conn.*



Self-Contained Spray Gun Fits Into Tool Kit

The little carbon dioxide cartridge originally used to produce carbonated water for whiskey and soda now serves as the propellant in a self-contained spray gun. One cartridge is sufficient to spray the entire contents of the 21-oz. container.

Made of cast aluminum and steel, the Spray-Gat gun has rust-resistant brass and stainless steel inserts. Paints, oils, enamels, varnishes, insecticides, or any water base materials are handled equally well by the unit.—*Emil Greiner Co., 20-26 North Moore St., New York 13, N. Y.*

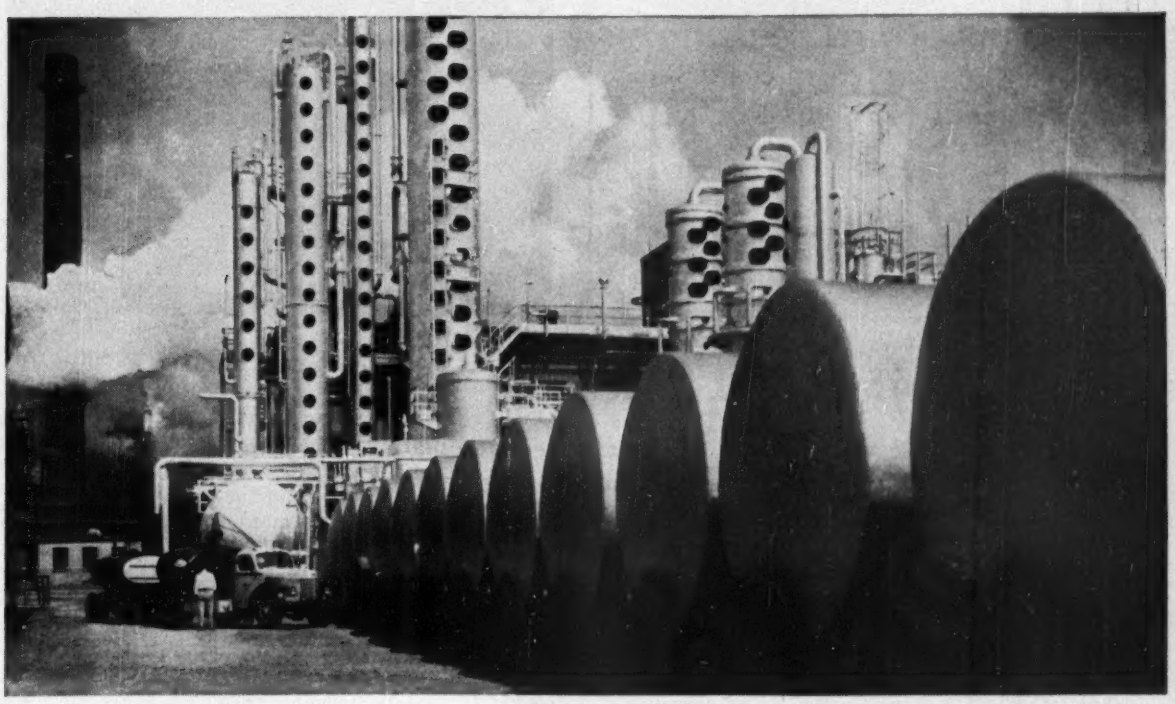
Paint Spray Has Electric Charge

A new paint spraying rig gives the paint particles an electrical charge within the spray apparatus itself. These charged particles are said to differentiate between painted and unpainted surfaces, producing an even finish and penetrating into all cavities and crevices. Paint consumption is drastically reduced and operator efficiency greatly increased, it is said.

The Ionic Gun is supplied with an ionic high potential power supply and control for 80 to 140 kvp. range. —*Scientific Electric, 117 Monroe St., Garfield, N. J.*

TANKS PREPARED FOR ALCOHOL STORAGE BY CHEMICAL CLEANING

Dowell Service removed all traces of oil after mechanical cleaning method failed



Can you imagine cleaning out oil storage tanks so well that they could be used to store a product such as alcohol, which is so easily discolored by oil and grease?

That's exactly what Dowell did for a customer who wanted to convert three 350,000 gallon tanks from oil to alcohol storage.

Previous attempts to clean the tanks by sand blasting had not been satisfactory. And there was particular difficulty in cleaning behind the overlapping plates of one riveted tank.

Dowell Service did the job in about 10 hours per tank with this result: *the tanks were completely free from oil and grease.* Dowell furnished all trained personnel, chemical solvents, high pressure jets, pump trucks and controls.

Tank cleaning, including removal of paint from external surfaces, is just one of hundreds of applications for Dowell Service using chemicals for maintenance cleaning. For complete information and estimates on the cleaning of your equipment, call the nearest Dowell office, or write directly to Tulsa, Dept. B33.

DOWELL SERVICE

Over 100 Offices to Serve You with Chemical Cleaning for:

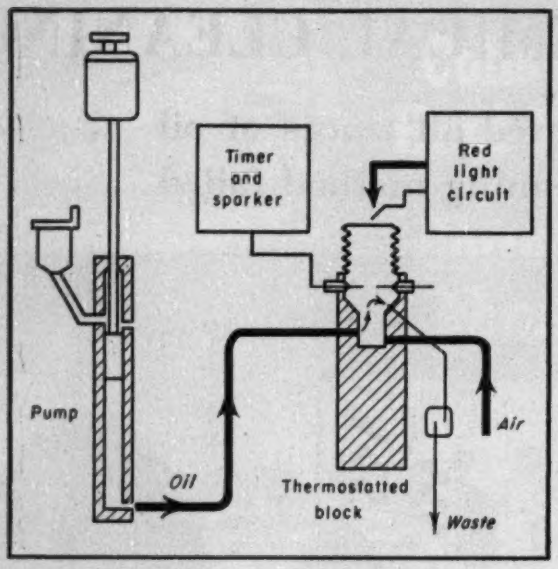
Boilers • Condensers • Heat Exchangers • Cooling Systems
Pipe Lines • Piping Systems • Gas Washers • Process Towers
Process Equipment • Evaporators • Filter Beds • Tanks

Chemical Services for Oil, Gas and Water Wells

DOWELL INCORPORATED • TULSA 1, OKLAHOMA

DOWELL

A Service Subsidiary of
THE DOW CHEMICAL COMPANY



Flash Points in a Flash

Flash point control tests are performed automatically in 2½ minutes. Tests are recorded on shipping tickets. A system of interlocks prevents test errors.

Flash point testing is a vital step in the manufacturing and distribution of petroleum products. While recognized as essential to safe handling and use this test has long been a considerable bother to men in the industry.

Safe handling requires flash points to be checked a number of times during manufacturing and distribution. After a material with a satisfactory flash point has been manufactured there is always danger of a change in this value through contamination. Therefore, the flash point is customarily checked a number of times both at the refinery and at distribution centers.

The total number of manhours required for testing is large when each standard test takes 20 min. per sample. By developing an automatic instrument to do this task in 2.5 min. the men in the Engineering Research Dept. of the Standard Oil Co. of Indiana have made a real contribution to the saving of manpower and time. And the instrument's utility may spread its use beyond the field of petroleum product manufacture and distribution.

Objectives reached in the design of this unit were:

1. It is completely automatic.
2. Operation is sufficiently foolproof and simple so that no training of operators is required.
3. Construction is satisfactory for operation in hazardous locations where vapor concentrations exist.
4. Machine becomes inoperative upon failure of power, air or any essential instrument component.

In principle the instrument merely establishes one fact. Does the sample material flash below or above a preset temperature? If the sample does not flash at the pre-set temperature then it passes the control test and the instrument so indicates.

The sample to be tested (approximately 100 cc.) is placed in a reservoir which drains into a pump barrel. After the sample has drained into the pump a gravity operated piston is released. As the piston descends it forces the oil through a flow-regulating capillary tube leading to a thermostatically controlled preheater block.

In passing through the preheater block the oil is heated to approximately the desired temperature. It then flows to the main thermostatically controlled block where it is mixed with air. This forms an air-vapor mixture in the test cup while the excess oil flows from the cup by gravity.

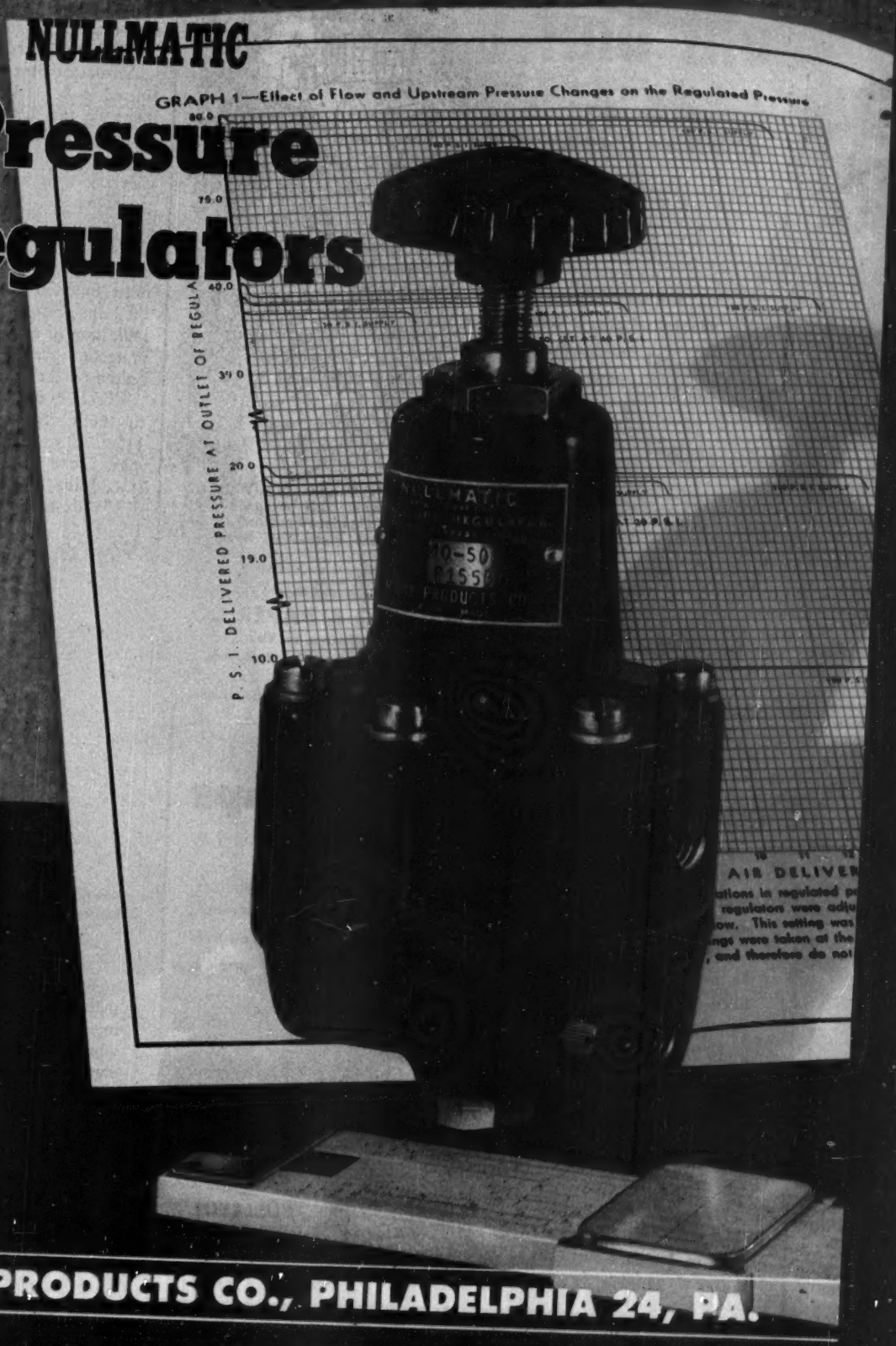
The air-vapor mixture in the cup is subjected to the action of an intermittent electric spark. If the flash point of the oil sample is below the temperature of the heated block, a flash will occur. The pressure developed by the flash expands a bellows assembly tripping a switch. Closure of the switch turns on a red light warning the operator that the sample has a low flash point.

In cases where no flashing occurs the sample obviously has a flash point above the set temperature for the test. When the pump piston reaches the bottom of its stroke the test is finished. Then a green light goes on showing that the sample has satisfactory flash point.

Simultaneously an electrical condenser is charged to actuate the IBM time clock which stamps the test record on the shipping tag. This information includes the date, time and the phrase "satisfactory flash point." Neither the green light nor the IBM stamp will operate if the sample has a low flash point.

Under normal circumstances the instrument is considered self flushing. However, where a test has detected a low flashing sample the instrument must be purged by run-

NULLMATIC
Pressure Regulators



MOORE PRODUCTS CO., PHILADELPHIA 24, PA.

WRITE FOR CATALOG ON NEW MODELS
HIGH CAPACITY ⅛, ¼, ½ SIZES

Behind
HAMMOND
Multi-Wall
BAGS
. . . are the features illustrated plus a thorough understanding of your shipping bag requirements
HAMMOND
Beldendale
MULTI-WALL
The preference for Hammond Multi-Wall Bags continues to grow steadily because of an ever-increasing list of satisfied customers in every industry where Multi-Wall Bags are used.
Write today for your copy of our booklet—
"To Serve You Better
with Hammond Multi-Wall Bags"

HAMMOND BAG & PAPER CO.

General Offices: Wellsburg, W. Va.

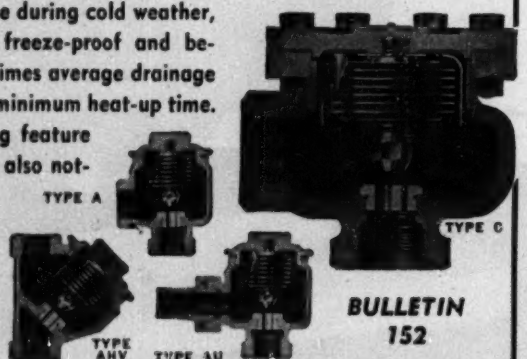
Plants in Wellsburg, W. Va. and Pine Bluff, Ark.

NICHOLSON MAKES

Freeze-Proof Steam Traps

for Every Plant Use

Because they drain completely when cold, these four types of Nicholson steam traps are positively freeze-proof. Can be freely installed outdoors. Universally recommended for use in lines which need not be in continuous use during cold weather, because they are freeze-proof and because their 2 to 6 times average drainage capacity results in minimum heat-up time. The non-air-binding feature of Nicholson traps also notably facilitates heat transfer in severe weather. Types for every plant use. Sizes ¼" to 2"; pressures to 250 lbs.



BULLETIN 152

206 OREGON ST., WILKES-BARRE, PA.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

ning through a high flash point sample before further tests are conducted.

Accuracy of the instrument is considered to be ± 1 deg. F. Readjustment of the bimetallic thermostats is done every two months to correct for natural drift tendencies. Daily checking with known oil samples is recommended.

A complete set of interlocks protects against erroneous results. Every component of the instrument must function correctly to complete the sequence of events leading to the indication of a satisfactory test. This protection even covers incorrect procedure on the part of the operator.

Effective operating range is 105 to 160 deg. F. Power required is 110-v., 60 cycle, single phase 1,250-w. max. Total weight of the instrument is 600 lb.—*Precision Scientific Co., 3737 West Courtland St., Chicago, Ill.*

Small Instrument Measures Vibration

Vibration measurements can now be made with a pocket-sized instrument only 6¾ in. long. The tubular shaped Vibra-Tak has a movable tuning slide that indicates the speed of vibration on a number scale. To operate the instrument, you merely place the bullet nose against the vibrating object and move the tuning slide up and down the scale until the wire reed extending from the nose reaches the maximum vibration displacement. Then you multiply the scale reading by one thousand to get vibration in cycles per minute or shaft speed in rpm. Vibrations can be measured over a range from 2,000 to 15,000 cycles per minute.

Indicated uses are checking high-speed machine rpm., studying vibration distribution and frequency on

You'll find them only in the

JOY WG-9 COMPRESSOR

These Exclusive Features are worth Money to you!

Only the JOY WG-9, in its class, offers replaceable crosshead guides and cylinder liners, and full force-feed lubrication—features that will save you money in operating and maintenance costs. Unique truncated pistons and angled over-size "Dual-Cushion" valves assure higher valve capacity, better heat dissipation, lower air friction and elimination of valve pounding.

The WG-9 is a water cooled, double acting, single stage, heavy duty compressor for use where medium amounts of air are needed or for supplementary service in high air-requirement industries. Vertical design minimizes vibration and cuts required floor space. Foundation is but a simple concrete pad.

15 SIZES • 30 to 150 lbs. psi • 172 to 881 CFM

Consult a Joy Engineer

JOY COMPRESSORS Meet any Need

High and low pressure compressors, oil free compressors, boosters and vacuum pumps—Joy builds a type and size for every need. • Let us handle *your* air-supply job.

Over 100 Years of Engineering Leadership

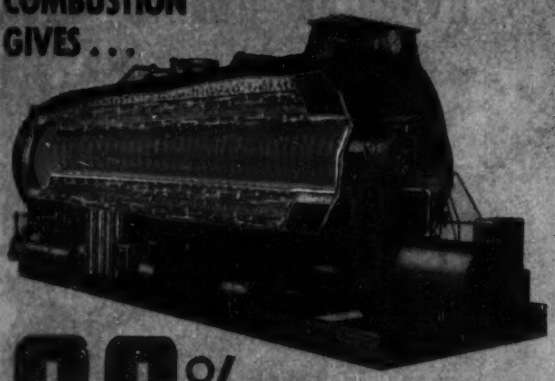
WAD 1 4030

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

ONLY CYCLONIC COMBUSTION GIVES . . .



66% MORE POWER
per sq. ft. of heating surface

By reducing heating surface requirements from 5 to just 3 sq. ft. per B.H.P., Cyclonic Combustion produces 66% more power per sq. ft.—saves up to ⅓ the space of conventional package steam generators. Cyclonic Combustion is the revolutionary new flame control used exclusively in Cyclotherm steam generators. Flame characteristics are controlled in a revolving spiral vortex traveling the full length of the furnace to insure maximum heat transfer without direct flame impingements or hot spots. The cyclonic action of the flame accounts for a 65 to 75% heat transfer within the main fire-tube. This high rate of heat transfer enables Cyclotherm 2 pass generators to maintain a guaranteed minimum efficiency of 80% for any steam requirement.

Cyclotherm steam generators with patented Cyclonic Combustion offer these additional features: Full power operation from a cold start in 15 to 20 minutes; Savings up to 50% on maintenance; Greater fuel savings; Boilers designed for oil or gas operation from 18 to 500 h.p., 15 to 200 psi operation pressure.

Proved superior in thousands of installations, Cyclotherm steam generators with new Cyclonic Combustion offer the most efficient and compact package steam generator on the market today. Find out more about Cyclotherm and Cyclonic Combustion—write today for a free illustrated folder.

The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of Underwriters Laboratories, Inc.

CYCLOTHERM
STEAM GENERATORS

Cyclotherm Division U. S. Radiator Corp.
Dept. 30
Oswego, New York
Please send without obligation my copy of "All Your Questions Are Answered by Cyclotherm."
NAME
FIRM
ADDRESS
CITY ZONE STATE

bins and hoppers where vibrators are installed, location of dead spots on the equipment where vibration is induced, and the location of unwanted vibration on other equipment—*Martin Engineering Co., Kewanee, Ill.*

Electronic Truck Scales Are Compact, Low Cost

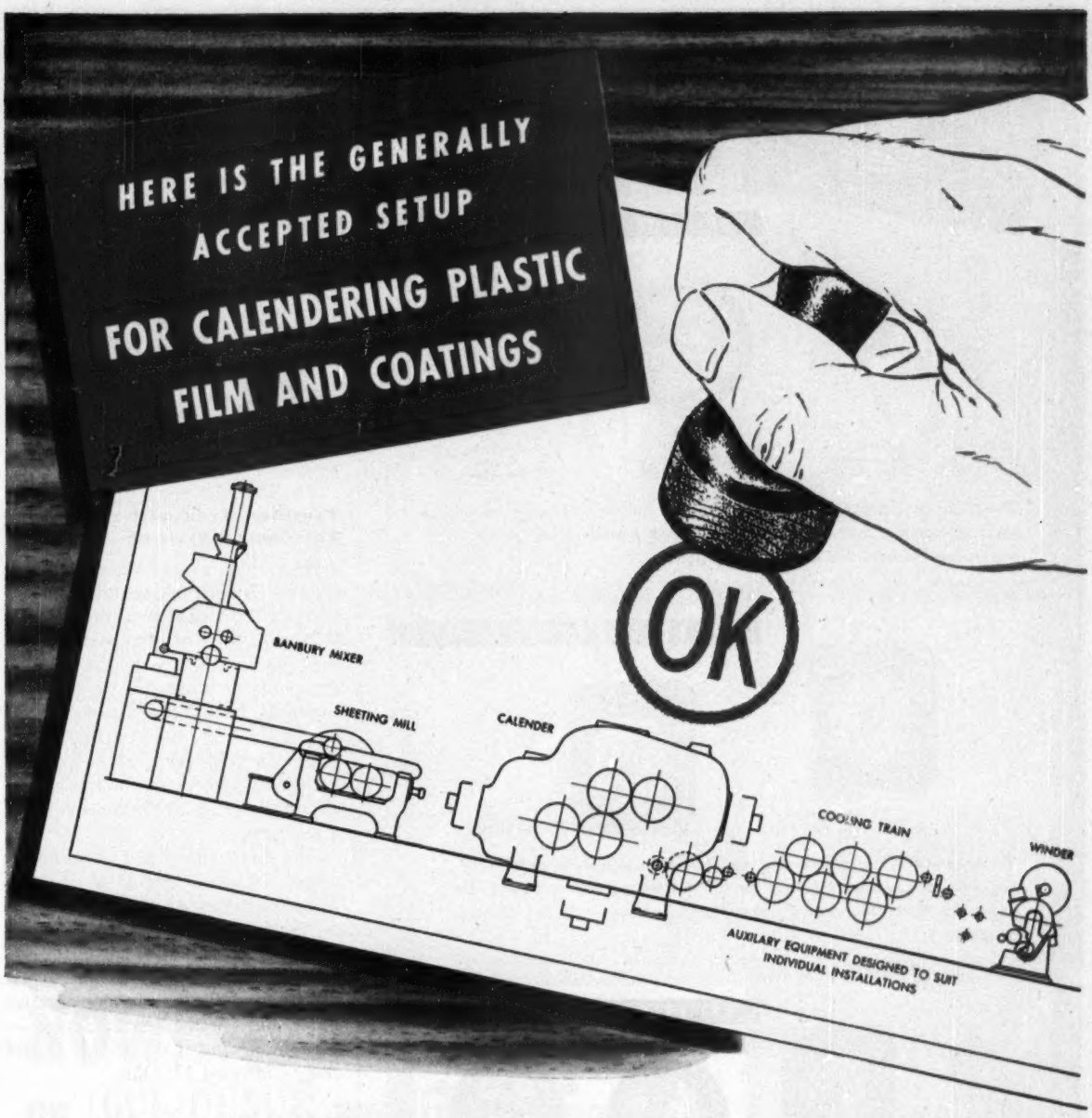
Electronic scales for weighing motor trucks and railroad cars are available at lower cost than most lever system scales, it is said. Additional savings up to $2,700 per installation may be realized due to the shallowness of the pit required. This equipment is the outgrowth of ten years' experience in the electronic weighing of aircraft.

Truck platforms are supported by four or six electronic weighing cells according to required scale capacity. These cells are 6 in. high and contain hermetically-sealed, permanent, resistance-wire strain-gage units which transmit the weight impulse to an indicator. Truck scale capacities range from 10 to 50 tons, while track scales go as high as 400 tons.

Both visual and printed weights are available. Weights within the 100,000-lb. range may be printed and read in 5-lb. increments. On 200-ton track scale equipment weights may be printed to the nearest 50 lb.—*Cox & Stevens Aircraft Corp., P. O. Box 30, Mineola, N. Y.*

Flowmeter Warns of Excess Flow

When a preset maximum flow limit is exceeded the Max-Alarm system gives a visual or audible warning signal and can act to stop the flow. The flow sensing unit is unaffected by pressure variations in the fluid system; can be used at pressures up to 20,000



This processing setup was developed several years ago by Farrel-Birmingham engineers, working with plastics manufacturers, to synchronize the progressive steps in the production of calendered plastic film and coatings.

Since then, many installations have been made in plastics plants. In fact, the combination has been giving such satisfactory service that it has become the generally accepted unit for this type of production.

Using this setup, one manufacturer has been able to produce, for the first time on a commercial scale, 1.7 gauge, calendered, unsupported vinyl film. The variation in accuracy of gauge of the final product is less than plus or minus .0001 inch.

Farrel-Birmingham engineers will be glad to help you select individual machines or combination units best suited to your specific requirements. Send for further information.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

INSTRUMENT PROBLEMS? TRERICE can solve them, Save you money too!

IF IT'S INDICATING

Industrial Thermometer No. A12403½ | Laboratory Thermometer No. 5152 | Dial Thermometer No. V80200 | Pressure Gauge No. 500

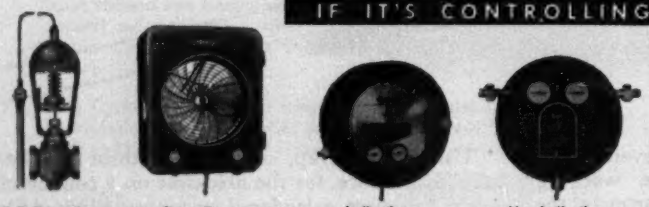
These Trerice *indicating* instruments give you hair-line accuracy on all kinds of industrial and laboratory jobs. They'll provide many years of trouble-free service, and they're priced right!

IF IT'S RECORDING

Thermometers No. M82117 | Gauges No. 85500

You can count on Trerice *recording* instruments. Thermometers are mercury-, vapor- and gas-actuated—one for any job where written records are necessary. Recording pressure and vacuum gauges, too, are built for long life.

IF IT'S CONTROLLING



Self-Operating Series 90000 | Recording No. M87000 | Indicating No. M87100 | Non-Indicating No. V85002

Easily adjustable, Trerice *controls* provide precision regulation with long life and simple maintenance. Yes, you'll save with a Trerice instrument of *any* type—save because of top performance, low initial price and long service.

SEND THIS COUPON TO

Yes, I want a catalog and information on Item No._____

NAME_____

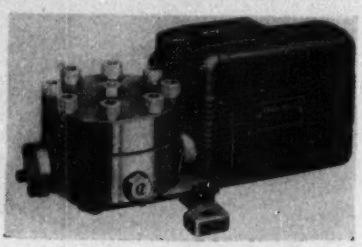
COMPANY_____

CITY_____ ZONE____ STATE_____

H. O. TRERICE CO. 1420 W. LAFAYETTE BLVD. DETROIT 16, MICHIGAN

Manufacturers of Temperature Instruments Since 1923

psi. and temperatures from 4 deg. absolute to 1,200 deg. F. Toxic or highly corrosive liquids, viscous fluids, liquefied gases, and other hard to handle fluids will not harm the Max-Alarm system.—*Potter Aeronautical Co., 87 Academy St., Newark, N. J.*



Pressure Transmitter For Control Systems

A recently announced differential-pressure primary element transmitter covers a differential pressure range of 0-20 to 0-200 in. of water at static pressures up to 1,500 psig. Installed at the point of measurement, the unit transmits an electric signal directly proportional to the variable being measured. This Type D2T Autronic differential-pressure transmitter is used in conjunction with the Autronic control system.

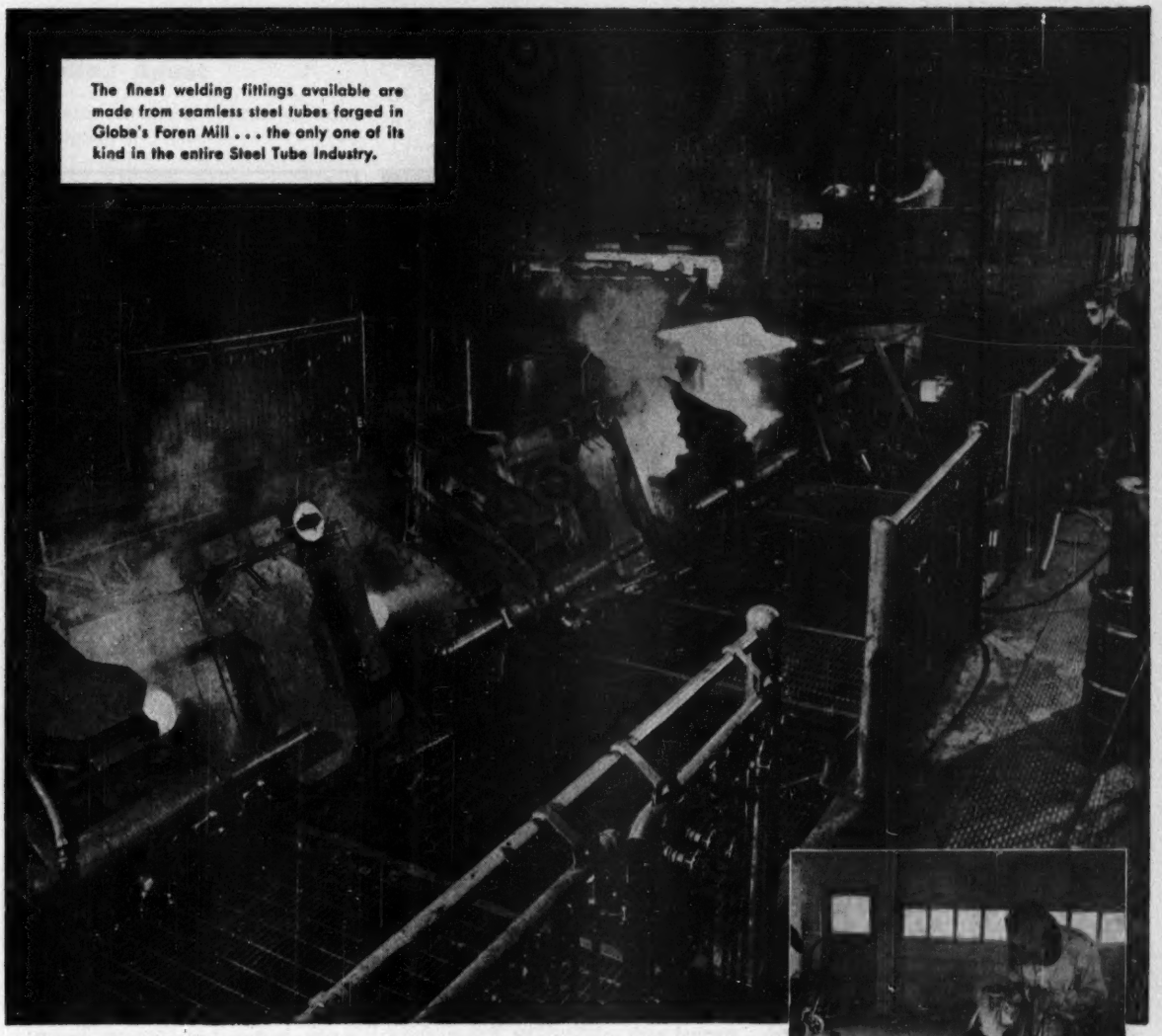
The transmitter has a corrosion resistant stainless steel diaphragm. Minute movements of the diaphragm are transmitted through an amplifying linkage to the movable core of the differential transformer. An a.c. signal output from the transformer operates other units in the control system.—*The Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio.*

Optical Pyrometer Fits Into Pocket

A new diminutive pyrometer is sufficiently small to be carried easily in your pocket. Weighing only 5½ oz., the instrument measures 2¼ in. O.D. by 6½ in. long. Temperatures up to 3,300 deg. F. can be measured.

To use, you simply sight the pyrometer on a bright object at normal atmospheric temperature and adjust the indicating needle to zero. Now the instrument is ready to give you temperature readings. These are indicated distinctly on a scale calibrated in degrees Fahrenheit.—*Allied Engineering Div., Ferro Corp., Harvard & East 56th St., Cleveland 5, Ohio.*

—*End*


The finest welding fittings available are made from seamless steel tubes forged in Globe's Foren Mill . . . the only one of its kind in the entire Steel Tube Industry.

NOW... get immediate delivery on GLOBE welding fittings...

the only seamless welding fittings precision processed from billet... to tube... to fitting

NOW — you can schedule immediate delivery on the finest welding fittings made today. Globe fittings — the only fittings manufactured through a continuous precision process that begins with the making of the seamless tube and continues through to the production of finished fittings.

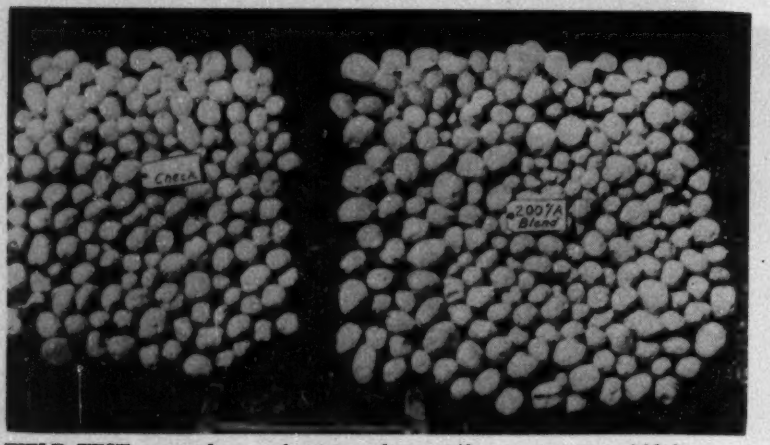
The exacting controls employed in this process — plus specialized research, testing and engineering insure uniform high quality and close tolerances. So, for the finest in welding fittings — order now — specify Globe—*and get immediate delivery.*

GLOBE STEEL TUBES CO., Milwaukee 46, Wisconsin

Chicago • Cleveland • Detroit • Philadelphia • St. Louis • New York
Denver • Houston • San Francisco • Glendale, Cal.

Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globetron (high purity ingot iron) seamless tubes — Globe Welding Fittings.

For complete information on the finest welding fittings available anywhere, send for the Globe Welding Fittings Catalog.



FIELD TEST on equal rows of potatoes shows a 40 percent greater yield from row treated with 200 lb. per acre of fritted trace elements.

Plants Flourish on Frit

Full plant growth is the reward claimed for feeding crops trace elements in their most acceptable form to date, i.e., embedded in a glass matrix.

Lack of trace elements in soil often markedly reduces yield and quality of plants. These elements—manganese, iron, zinc, copper, boron, molybdenum—sometimes make their absence felt more strongly than a major soil nutrient like nitrogen.

A new soil additive is said to do the most efficient least expensive job yet of filling these needs. It is called FTE, an abbreviation for fritted trace elements. A fine brown powder, the product contains the elements embedded in a glass matrix.

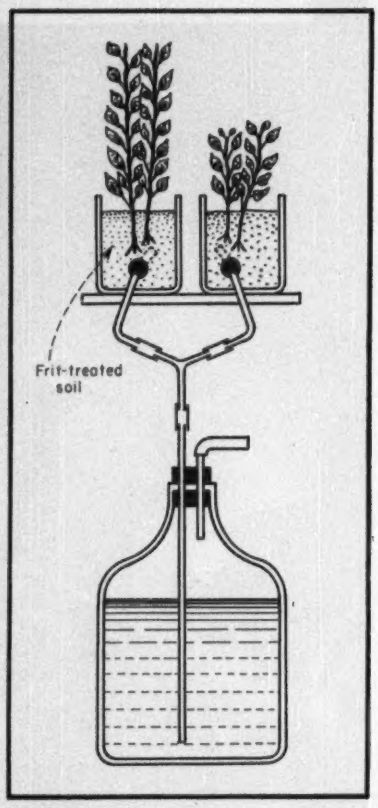
►**Slowly Soluble**—This form of product provides a slowly soluble source of minerals necessary to full plant growth. The key words are "slowly soluble." It is this property which overcomes the inherent disadvantages in the conventional method of applying trace elements to the soil in the form of soluble salts. Unlike these, FTE (1) will not wash out of the soil. It remains at least a full season making repeated applications unnecessary. (2) will not react chemically with the soil to become fixed or unavailable to the growing plant. (3) will not poison the plants because of over-concentrated application of any element.

Tests on a variety of crops all over the country have shown decidedly better yields and better quality for plants treated with FTE as opposed to those treated with soluble salts. For instance, frit-treated potato plants showed a 45 percent better yield.

FTE is said to contain a balanced mixture of iron, boron, manganese, zinc, copper and molybdenum, six trace elements necessary for healthy plant growth. Thus, when used with normal NPK fertilizers, it provides plant protection and stimulation in all types of soil.

The product's method of working belies the long-standing belief that trace elements have to be soluble in water to enter the roots of the plant. The frit gives nutrients to the plant principally by contact with root hairs.

The normal method of application is to broadcast with mixed fertlizers at a rate of 50 lb. to the acre. FTE will be sold to the farm market, probably its greatest ultimate outlet, at 11 or 12 c. a lb. Ferro Corp., Cleveland firm which developed the product, will handle that end. But the company has made an arrangement with Du Pont whereby the latter will handle distribution of packages for home gardeners.



LABORATORY TEST shows growth-difference made by FTE.

►**Not a Byproduct**—Ferro spent 5 years and $250,000 in developing the product. Their work, incidentally, was inspired by an article in this magazine in April 1945 entitled "Soluble Glass May Offer Fertilizer Possibilities" by A. E. Badger and R. H. Bray. One of the nation's largest manufacturers of a glassy material called frit which is applied to steel to produce porcelain enamel, the company became interested in trace elements when it was found that the production of slowly soluble trace elements was analagous to its standard manufacturing techniques. Company spokesmen emphasize, however, that FTE is in no way byproduct. It is expected to cut a very substantial swath in the agricultural chemical market all by itself.—*Ferro Corp., Agricultural Div., 4150 East 56th St., Cleveland 5, Ohio.*

IN BRIEF—A capsulated listing of this month's newsworthy products

It's New . . .	It's Good for . . .	See Page . . .
Agricultural Frit	Supplying trace elements to plants	228
Bonding Agent	Joining metals to metals or nonmetals	229
Porcelain Enamel	Acid-resistant coating for steel	229
Motor Oil	Decreasing octane requirements of fuel	229
Synthetic Fiber	Use in filter cloths to resist caustic	230
Fungicide	Fighting decay in wood, textiles, paper	230
Polyhydroxaymine	Surface active agents, pharmaceuticals	230
Popped Vermiculite	Insulating molten metal	230
Resin	Forming clear, chemical resistant coatings	232
Fuel Additive	Improving quality of all types of diesel fuels	234
Chloroacetamide	Catalyzing resin-making reactions	234
Fiber Glass	Insulating, sound absorption and flotation	234
Polystyrene	Resisting shock and heat	236
Catalyst	Accelerating curing of latex emulsions	236
Primaquine	Destroying parasite causing malaria relapse	236
Soybean Meal	Promoting animal growth via high protein content	236

Bonding Agent

Joins metals to metals or nonmetals.

A new bonding agent, ChemoTec, has been formulated for joining metals to each other, to similar or dissimilar metals, or to nonmetallic materials like ceramic, glass or wood.

Available in rod, powder, paste and liquid forms, the product, an organic compound, is recommended for production joining of titanium, magnesium, aluminum and similar difficult-to-bond metals.

In rod form it is applied with a welding-rod technique. The part to be joined is broadly heated to only 250 to 300 deg. F. Tensile strengths in excess of 5,000 psi. have been obtained. The rod bonds by capillary and chemical action, has high fluidity and the extraordinary wetting characteristics enable the thin flowing material to penetrate all but sealed joints.

The application of heat sets up a chemical reaction which changes the molecular structure and fuses the bonding material. The process gives a bond at the interface said to be equal to the tensile strength of the bonding material itself.—*Eutectic Welding Alloys Corp., ChemoTec Div., 40-42 172 St., Flushing, N. Y.*

Porcelain Enamel

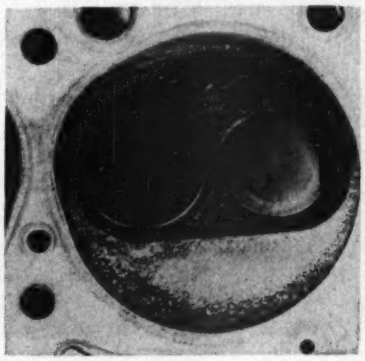
Acid-resistant coating for steel used in chemical industry vats and piping.

A new porcelain enamel coating for steel, known as CRC-14, is said to withstand a boiling sulphuric acid solution with a weight loss of only 1 mg. per sq. in. in a 24-hr. period. This compares with weight losses of 5 mg. per sq. in. in only a 2-hr. period for previously developed acid resistant ceramic coatings.

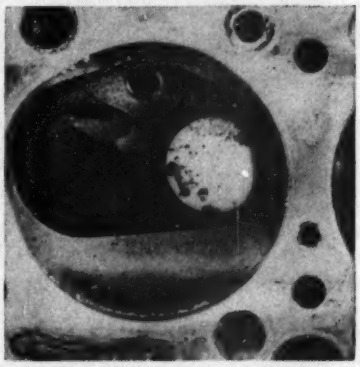
Thermal shock tests have shown that CRC-14 can withstand five cycles at 800 deg. F., compared with 600 deg. F. for other such finishes.

The manufacturer points out that the characteristics of the new finish when applied to low carbon steel compare very favorably with those of stainless. The finish can be produced on steel to meet any requirments or specifications at a cost only slightly higher than ordinary porcelain enamel.

Possible applications of the new material include use for vats and piping in food, chemical, pharmaceutical or bacteriological industries. It is particularly well suited for flue linings exposed to acid fumes, where frequent and sharp temperature changes are necessarily encountered. — *Seaporcel Metals, Inc., 28-20 Borden Ave., Long Island City 1, N. Y.*



Using old high-quality oil.



Using new oil.

Motor Oil

Decreases deposits in combustion chamber thus decreasing octane requirement of fuel.

A new motor oil has been developed specifically for use with modern high-compression automobile engines. The oil is said to reduce formation of combustion chamber deposits in new engines, or engines in good mechanical condition.

It is these deposits which raise octane requirement and may result in power-wasting knock. Ultimate octane requirements of an engine using conventional SAE-10 oil is about 13 as compared with about 8 for the new oil, SAE-20-5W.

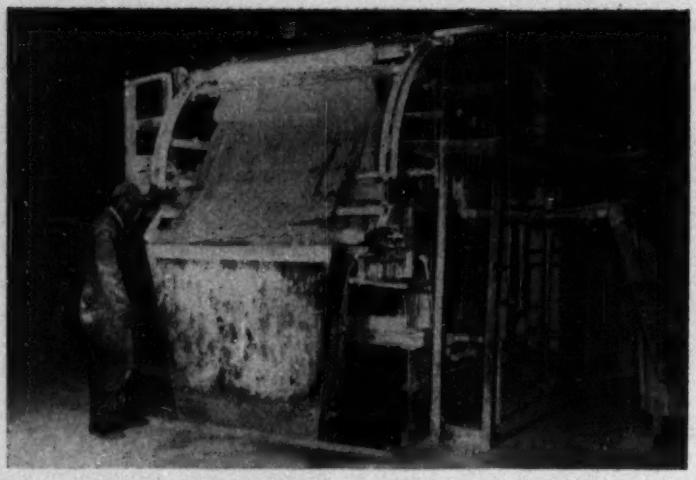
What's more the new oil is said to be good for year round operation. It thins out less at high temperatures and is less than half as viscous as conventional 10-W oils at 0 deg. F.

Since it is more fluid at start-up temperatures, it provides immediate lubrications of all engine parts and reduces engine wear. Because of its high viscosity index, it continues to protect the engine under hot running conditions.

The most effective way of reducing the drain on the battery is through the use of motor oils of lower viscosity. For a temperature drop from 70 deg. F. to 40 deg. F. the viscosity of the SAE 10-W motor oil increases from 550 to 1600 Saybolt seconds, while that of the new motor oil increases only from 315 to 725 Saybolt seconds —giving a value less than half that of the SAE 10-W oil.

The superior features of the new oil are said to be due to a very careful blending of base stock. And acid-neutralizing additives (detergents) contained in the product are said to cut corrosive wear in half.

Cost of the new oil which went on the market in December is about 55 cents a quart as compared to about 40 cents for older high-grade oils. According to the manufacturer, the difference is well worth it for new engines of the high compression type.—*Standard Oil Development Co., 15 West 51st St., New York 19, N. Y.*



DYNEL FILTER CLOTH'S CAUSTIC RESISTANCE CUTS COSTS

Since Foote Mineral Co. started using Dynel filter cloths in its rotary vacuum presses, number of shutdowns and cost of replacement have dropped sharply. Extracting caustic solution from waste solids, the presses used to be fitted out with cotton and some nylon cloths which deteriorated relatively fast. Dynel, subjected to 50 percent NaOH and 38 percent NH_4OH, showed no physical changes in recent tests. Carbide and Carbon Chemicals Co., Textile Fibers Dept., 30 East 42nd St., New York 17, N. Y.

Fungicide

Fights rot and decay in wood, textiles, cordage, felt, paper.

A new fungicide, a reaction product of Hercules Powder Co.'s rosin amine D and pentachlorophenol, is said to be an improvement over the latter against wood-rotting. Solubility, also, is improved and crystallization of pentachlorophenol is eliminated in the formulation of wood-treating preparations.

In effect, rosin amine D enhances the fungicidal properties, decreases the vapor pressure, and makes unnecessary the use of high-cost auxiliary solvents and other special agents generally required with pentachlorophenol preservatives.

Called Rosin Amine D Pentachlorophenate, the new product is a resinous solid. It is readily soluble in a wide range of oils and hydrocarbons and may be readily emulsified. It is used in concentrations of 0.3 to 1.5 percent as a fungus preventive for cordage, textiles, paper and felt. In addition it is being tested as a preservative for adhesives and paints.

Rosin Amine D Pentlachlorophenate also has the advantage of being relatively nonirritating to the skin.

The new preservative has been subjected to an extensive four-year test program, a cooperative project of Hercules Powder Co. and Monsanto Chemical Co. Besides, various governmental and commercial laboratories have participated in the evaluation. Monsanto is the first licensee under the Hercules patents.

It is now commercially available in the form of solution and emulsion concentrates from qualified formulators licensed under patents held by Hercules.

The widespread acceptance by industry of the new product has necessitated the construction of new and enlarged Rosin Amine D production facilities at Hercules' Hattiesburg, Miss., plant.—*Hercules Powder Co., Wilmington, Del.*

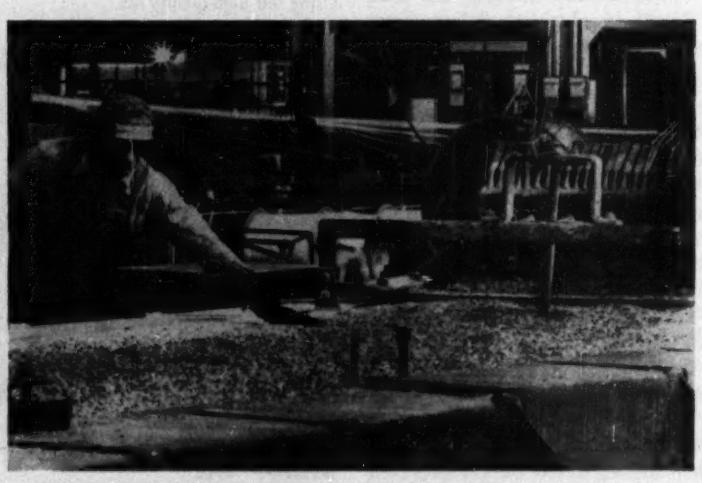
Polyhydroxyamine

To synthesize surface active agents, pharmaceuticals, dyeing assistants.

Experimental quantities of white, crystalline n-methylglucamine are now being offered by Commercial Solvents Corp.

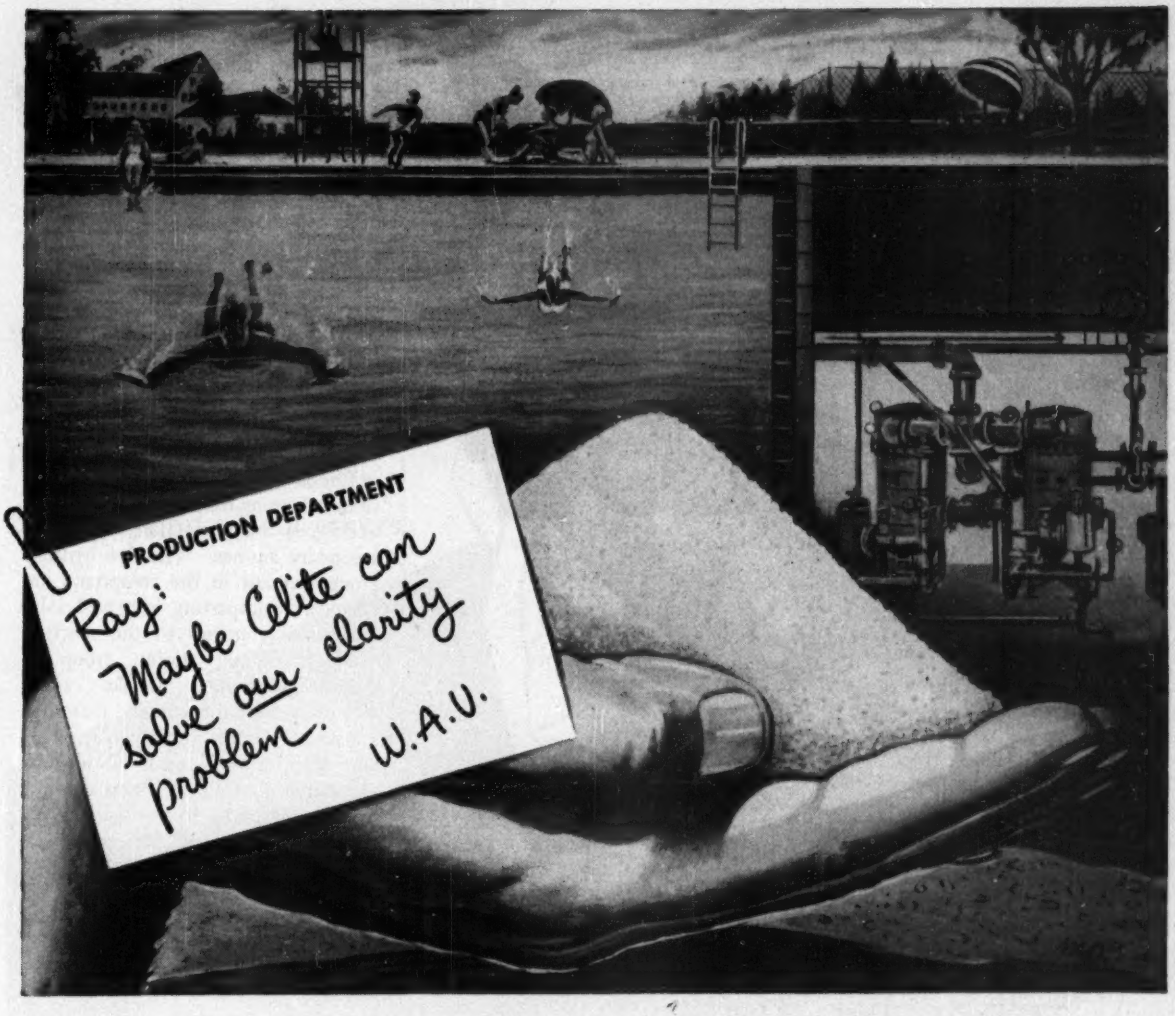
Interesting surface active agents have been prepared from the compound in the company's laboratories and marketed under the trade name, Glucaterge. Nonionic and anionic detergents can be prepared by reaction with fatty acids. The resultant products are characterized by imparting high viscosity to solutions, building foam, good detergency, and emulsification properties.

Coupled with diazotized m-chloroanimine, n-methylglucamine is said to produce a dye with excellent fastness on textile materials. Also, metal-free phthalocyanines have been prepared economically by heating phthalonitrile



POPCORN-LIKE VERMICULITE INSULATES MOLTEN METAL

Tiny air cells in each particle of vermiculite slows heat so that a hand can be placed on a 3-in. layer covering molten zinc. Also vermiculite, with clay binders, is being used in insulating firebricks. In the service range up to 1,800 deg. F., they show high resistance to cracking caused by impact or thermal shock and good physical and chemical stability. They are suggested as back-up insulation for refractory brick. Zonolite Co., 40 East 49th St., New York, N. Y.



"Fresh-up powder" for busy pool water

To keep the water in their swimming pools constantly refreshed, many operators swear by the thorough cleansing action of Celite* filtration.

By removing algae, chlorine-resistant amoebae—and other suspended impurities—Celite Filter Powders provide an uninterrupted flow of clear, clean water. They also reduce the need for chemical treatment.

The effectiveness of Celite—in this and countless other operations—can be attributed to these important factors which make it unique among filter aids:

Carefully processed from a large and pure deposit of diatomaceous silica, Celite is available in several standard grades—each designed to trap suspended impurities of a given size and type. Whenever you reorder, you are assured of the same uniform, accurately graded powder received in your initial order. Thus, with Celite, you can count on consistent clarity and purity in your filtrates—at highest rate of flow—month after month, year after year.

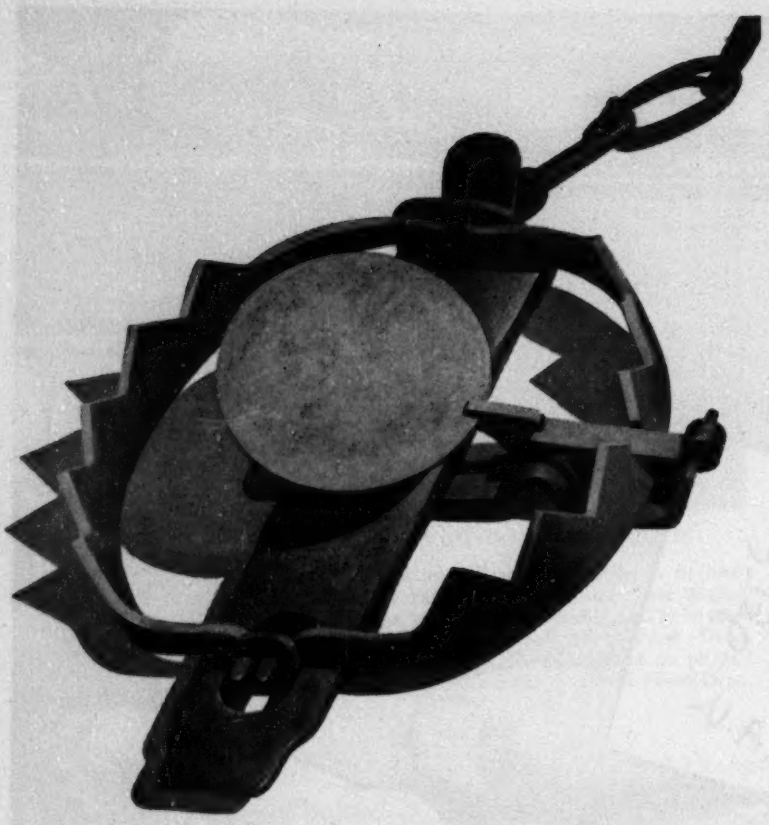
Keeping swimming pool water constantly refreshed is one of many processes in which Celite provides vital clarity. The proper grade of this filter aid will assure you the same results—regardless of your product or process. To have a Celite Filtration Engineer study your problem and offer recommendations, write Johns-Manville, Box 290, NewYork 16, N. Y. *No cost or obligation.*

*Reg. U. S. Pat. Off.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE

FILTER AIDS



All over your building, fire sets its traps. In dip tanks, transformer vaults, storage spaces. In fact, wherever it can stop your business in its tracks. Make sure you don't fall victim. Post a KIDDE Portable Extinguisher next to every fire hazard.

Kidde

Walter Kidde & Company, Inc.,

228 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

and a caustic alkali in the presence of n-methylglucamine with water soluble or insoluble solid diluents. The pigments resulting from this process are claimed to have superior tinctorial properties in printing inks, paints, and other pigments.

Good fastness in printing vat dyestuffs is said to come of incorporating substances such a n-methylglucamine with the vat dyestuffs. The vat dyestuffs may be used in direct printing, as well as in discharge and resist printing processes.

Its chemical and physical properties, which also suggest application in the synthesis of pharmaceuticals, can be summed up as follows: The product undergoes many reactions typical of secondary amines. The five hydroxy groups present in the compound are effective in imparting improved solubility characteristics to the reaction products of the amino group of n-methylglucamine. Unlike other secondary aliphatic amines, n-methylglucamine recacts very slightly, if at all, with nitrous acid. N-methylglucamine does not polymerize or dehydrate internally to any marked extent unless heated for prolonged periods at temperatures above 150 deg. C.—*Commercial Solvents Corp., 17 East 42nd St., New York 17, N. Y.*

Resin

Clear, chemical resistant coating for wood, metal, plastics, fabrics.

Clarity, resistance to chemicals, durability and low pigment reactivity are claimed for a new water-white solid polymer of an acrylic type ester.

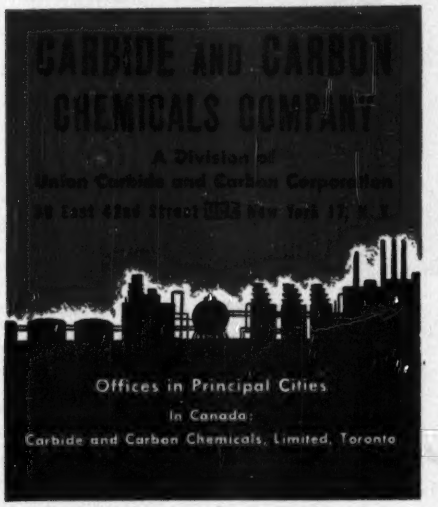
Called Acryloid B-82, 100 percent solids, the resin is recommended for the production of many specialty coatings for wood, metal, plastic materials and fabrics. It is a good vehicle for fluorescent and phosphorescent pigments because of its low reactivity with these sensitive materials.

Acryloid B-82, 100 percent does not have a sharp melting point, but softens instead in the range 70-80 deg. C. and flows at 140-155 deg. C. Acryloid B-82 is also available as a 40 percent solution in toluene.

It is soluble in toluene, xylene and other aromatics. It can be put into solution using conventional tumbling barrels, pebble mills or shellac cutting equipment. For laboratory work the

YOU'LL BE A JUMP AHEAD...

by selecting from Carbide's wide range of solvents—more than 75 esters, ketones, alcohols, and glycol ethers.


CARBIDE AND CARBON CHEMICALS COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street New York 17, N. Y.
Offices in Principal Cities
In Canada:
Carbide and Carbon Chemicals, Limited, Toronto

An outstanding example to meet your solvent needs is the versatile glycol-ether, Butyl "Cellosolve." It is an excellent solvent for alkyd, phenolic, and nitrocellulose resins, industrial cleaners, insecticides, and herbicides. Butyl "Cellosolve" is also a mutual solvent in soluble metal-cutting and textile oils.

But no matter what your solvent needs may be, it's always a wise move to check with Carbide and Carbon, the solvent center. For further information on solvents, or any of Carbide's chemicals, write to our sales office nearest you. Ask for your copy of the new booklet, "Physical Properties of Synthetic Organic Chemicals." (F-6136)

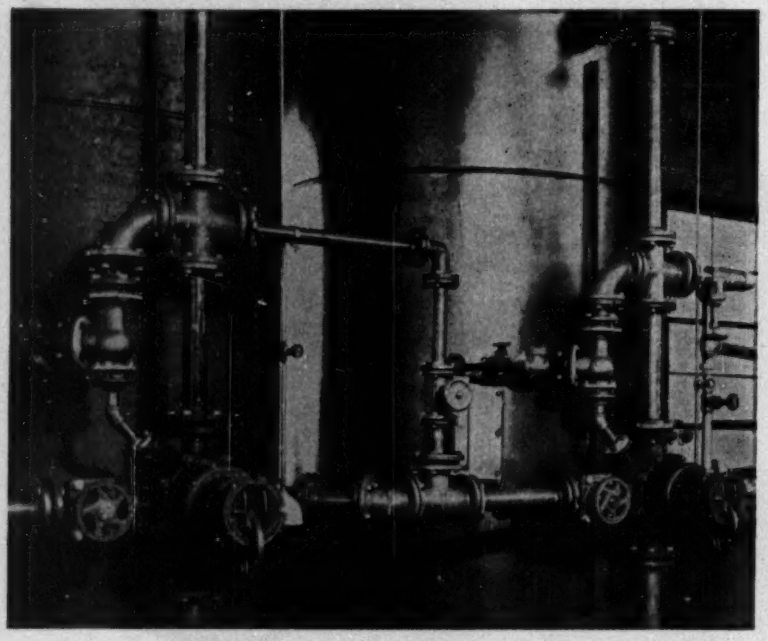
DOW

CUT CORROSION COSTS

install corrosion-resistant

SARAN LINED STEEL PIPE

for long, trouble-free service



Saran Lined Pipe, Fittings and Valves are used in this automatic water deionizer in a large water purification system. Installations such as this give trouble-free service for many years.

Saran Lined Pipe Company
2415 Burdette Ave., Ferndale, Mich.
Please send me a copy of your catalog on Saran Lined Pipe, Valves and Fittings.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

Corrosion-resistant Saran Lined Steel Pipe sharply reduces repair and maintenance costs in corrosive piping installations. Downtime is cut to a minimum because this rigid pipe has high pressure strength and durability—which mean dependable, long-term service. Easily installed Saran Lined Steel Pipe can be cut and threaded in the field—no need for special tools or handling. Wherever superior resistance to most chemicals and solvents is demanded, be sure to consider Saran Lined Pipe, Fittings and Valves. Write to the distributor: SARAN LINED PIPE COMPANY, 2415 Burdette Avenue, Ferndale, Michigan. Offices in: New York • Boston Pittsburgh • Tulsa • Philadelphia Chicago • Portland • Indianapolis San Francisco • Houston • Denver Los Angeles • Seattle • Cleveland Charleston, S. C. • Toronto • Montreal. Clip and send today!

you can depend on DOW PLASTICS

DOW

resin can be dissolved conveniently in jar mills or in cans or bottles placed on rotating rolls.—*Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa.*

Fuel Additive

Increases tendency of all types of diesel fuels to ignite.

"A mixture of amyl nitrates" is how Ethyl Corp. describes the composition of its new fuel additive, Ignition Improver (DB-36). Minute amounts are said to improve ignition quality of all types of diesel fuels.

Blending the additive into diesel fuels is said to be safe, simple and inexpensive. It can be performed either at a refinery or a storage terminal.

Ethyl puts the compound on the market after 5 years of research and development and a successful year-long test program with the U. S. Navy. It is available in 55-gal. drum quantities.—*Ethyl Corp., 100 Park Ave., New York 17, N. Y.*

Chloroacetamide

Catalyst in resin-making, anti-fogging agent in photography.

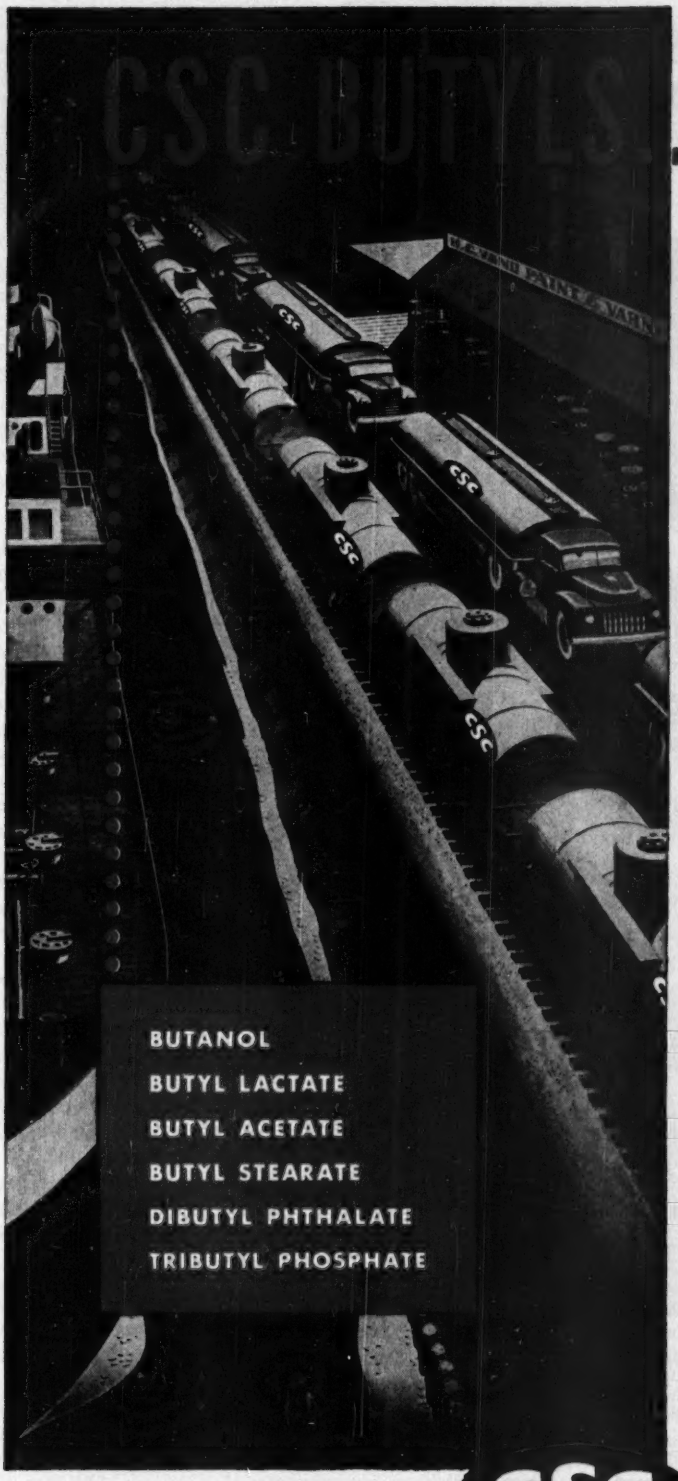
Alpha-chloracetamide, now in semi-commercial production, acts as an effective acid-type catalyst for urea formaldehyde, melamine formaldehyde and similar materials. The generation of heat produces a low pH which further catalyzes the reaction.

The product, a white crystalline solid, can be used by the photographic industry as an anti-fogging agent.

Additional potential uses may well be found in the synthesis of such organic intermediates as: alpha chloro acetonitrile, alpha amino acetamide, alpha cyano acetamide, beta amino propionamide. Many of these intermediates are finding applications in the pharmaceutical, dye and surface active agent fields.

Price of chloracetamide, currently available in a technical grade, is $1.50 a lb. for 250-lb. lots or more. As production is increased, a corresponding decrease in price is expected.—*Chemical Development Corp., Danvers, Mass.*

Superfine fiber glass for insulating, sound absorption and flotation purposes is now being produced by Pittsburgh Plate Glass Co. Also, the company will soon start produc-



...in America's production picture

Take a good look at the butyls picture at CSC. Commercial Solvents Corporation was the first producer of Butanol by an exclusive fermentation process in 1920. Today, with greatly expanded production facilities, backed by a quarter century of know-how, CSC is still a leader in the butyls field.

Plants, warehouses and sales offices coast to coast bring CSC's butyls and butyl derivatives to industry's door. No matter what your need ... from a drum to a tanker ... CSC is ready to serve you promptly, efficiently.

There are still no substitutes for butyls in making the finest lacquers. Countless other uses confirm the importance of butyls in American industry:

HYDRAULIC FLUIDS • METAL CLEANERS
BLENDING AGENTS • SELECTIVE EXTRACTANTS
SYNTHETIC RESINS • HERBICIDES
RUBBER CHEMICALS • LUBE OIL ADDITIVES

Write, wire or phone Industrial Chemicals Division, Commercial Solvents Corporation, 260 Madison Avenue, New York 16, N. Y., for full information.

Ethyl alcohol and derivatives • Methanol
Methylamines • Ammonia • Aminohydroxy Compounds
Riboflavin crystals • Ethyl acetate • Ethyl lactate
Diethyl maleate • Hydroxylammonium salts
Nitrohydroxy compounds • Nitroparaffins
Alkaterge®-C • Formaldehyde NF • Pentaerythritol

INDUSTRIAL CHEMICALS DIVISION

COMMERCIAL SOLVENTS CORPORATION

CSC

ALDEHYDES • ALCOHOLS • ESTERS • AMINES • AMINOALCOHOLS
AMMONIA • NITROPARAFFINS • SOLVENTS • PLASTICIZERS • INTERMEDIATES

AHEAD OF THE VAPOR TRAIL . . .

LEBANON Castings ARE AT WORK

THAT streak in the sky is a Curtiss-Wright Sapphire J-65 Turbo Jet Engine powering a high-altitude plane. The intense heat—approximately 1500° F.—developed during flight is enough to disintegrate "normal" materials, formed in the usual way. Yet in this inferno of power Lebanon Stainless Steel Centrifugal* Castings of special heat-resistant alloys are giving dependable service as . . .

TURBINE SHROUDS
HEAT SHIELD SUPPORTS
EXHAUST CONE FLANGES
COMBUSTION CHAMBER FLANGES
TURBINE BLADE SPACER RINGS

*"CENTRI-DIE", patented name for method of casting steel centrifugally in metal molds, under license agreement with Firth-Vickers Stainless Steels Limited, Sheffield, England. Lebanon also makes steel castings, both static and centrifugal, in refractory molds.

Have you seen . . .
STEEL WITH A THOUSAND QUALITIES?

This 37-min., 16 mm., full-color sound film showing steel castings from blueprint to end use should be shown to your organization. For information, write: Dept. F, Lebanon Steel Foundry, Lebanon, Pa.

LEBANON Castings
CARBON, SPECIAL ALLOY AND STAINLESS STEEL

PRODUCT NEWS, cont. . .

tion of continuous or strand fiber glass used in yarn form as electrical insulation and in the textile field for the manufacture of noncombustible fabrics for many purposes. —Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh, Pa.

Modified polystyrene has been developed which is said to have improved shock resistance as well as excellent heat resistance. Called MC 409, the product has shown ASTM heat distortion temperature values as high as 198 deg. F. At the same time elongation in tension is five to six times that of regular polystyrene.—Koppers Co., Chemical Division, Pittsburgh 19, Pa.

A new catalyst designed to accelerate the curing of many latex emulsions has been developed. Test results indicate that the product, called Cyclodex, improves adhesion of latex films increases film toughness to resist damage or injury by rubbing, scuffing or marring. Latex primers containing Cyclodex require less time before application of oil or resin type top coats, according to laboratory data. A free-flowing, water dispersible liquid, it is said to be easily incorporated into latex formulations.—Nuodex Products Co., Elizabeth, F, N. J.

New antimalarial, primaquine, has been found to destroy the parasite causing malaria relapse. This claim is backed up by studies conducted by teams of malaria experts sponsored by the U. S. Army and Public Health service. One of the 8-aminoquinolines group, the drug is said to be more effective and less toxic than older antimalarials.—Winthrop-Stearns Inc., 1450 Broadway, New York 18, N. Y.

New solvent-extraction process for soybeans produces a meal for animal feed with excellent growth promoting properties. Using hexane as solvent, the process breaks down the cellular structure of the meal so that its protein content is more available to digestive action. Although the protein factor contributes most to the product's superiority, it is also said to have 100 percent more thiamine and increased availability of essential amino acids.—*Central Soya Co., 300 Fort Wayne Bank Bldg., Fort Wayne 2, Ind.* —*End*

"WHERE DO YOU GET YOUR ALKALIES, JIM?

"I ALWAYS GO TO SOLVAY *FIRST* FOR ALKALIES...*Here's why...*

REG. U. S. PAT. OFF.

SOLVAY

Soda Ash
Caustic Soda
Caustic Potash
Chlorine
Potassium Carbonate
Calcium Chloride
Sodium Bicarbonate
Specialty Cleansers
Sodium Nitrite
Monochlorobenzene
Para-dichlorobenzene
Ortho-dichlorobenzene
Ammonium Bicarbonate
Ammonium Chloride
Sesquicarbonate of Soda

...**First off, I've found** that Solvay always takes care of its customers—in good times and bad! I know I can really depend on Solvay in a pinch.

I also like the treatment I get from the sales staff—always courteous and helpful. And it's convenient doing business with Solvay because one of their sales offices is located near me.

In addition, I feel that when I buy alkalies, I might as well get the "extras" that Solvay offers ...like the Solvay Technical Bulletins that give you the kind of information no other technical bulletins have. Same with the Solvay Technical Service staff, a group that operates on an industry-wise basis, with men who are experts in individual industries.

Then Solvay has over 200 local stock points that practically cover the country, and three centrally located plants. This makes for better delivery service.

And, of course, I know I get dependable quality and uniformity when I order from America's oldest and largest producer. That's why I always go to *Solvay first* for alkalies.

SOLVAY PROCESS DIVISION
Allied Chemical & Dye Corporation
61 Broadway, New York 6, N. Y.

BRANCH SALES OFFICES

Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit
Houston • New Orleans • New York • Philadelphia • Pittsburgh
St. Louis • Syracuse

MR. SOAPER!

If you're not selling detergents

you're missing ½ of the market!

With Detergent* ALKANE *you can double your sales potential!

You know that detergents are here to stay—already they comprise 50% of washing product sales.

If you're planning for the future, now is the time to get into the detergent market. It may be easier and less costly than you think.

Oronite can now offer you improved Alkane—the basic raw material used in making the highest quality synthetic detergents. Alkane is available at a consistent low price. In the past seven years, because of expanding production and improved technology, there have been many price decreases on Alkane. Thus Alkane assures you of a stable market price on your finished detergent product.

Our engineering service has a plant design to fit your needs. A large equipment investment may not be required to sulfonate your own detergents from Oronite Alkane—possibly a great amount of your present equipment can be utilized. (Alkane is available in assured supply from three strategically located bulk terminals.)

Our technical assistance is available to you free of charge. Equipment prices, performance data, yields and all other technical information to show you how to make detergents profitably can be furnished on request.

If you are interested in entering the detergent market, or wish to see how economically you can convert your own plant to detergents, address an inquiry to any Oronite office. We will have a qualified representative contact you.

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

"World's largest producer of synthetic detergent raw materials"

ORONITE CHEMICAL COMPANY

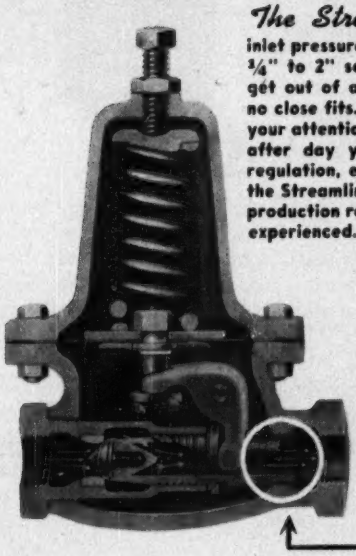
38 SANSOME STREET, SAN FRANCISCO 4, CALIFORNIA
30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK
STANDARD OIL BLDG., LOS ANGELES 15, CALIFORNIA
600 S. MICHIGAN AVENUE, CHICAGO 5, ILLINOIS
MERCANTILE SECURITIES BUILDING, DALLAS 1, TEXAS

2012

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE REDUCING VALVE

3 IMPORTANT CONSTRUCTION FEATURES THAT GIVE YOU

Accurate, Reliable, Pressure Reduction Service for STEAM, AIR, OIL... Most Anything that Flows... AT DEFINITE COST SAVINGS



The Streamlined Type 1000 **is available with inlet pressures to 3000 lbs., delivering vacuum to 125 lbs. Sizes ¼" to 2" screwed ends. There are no complicated parts to get out of order — no small ports or passages to clog up — no close fits. You will get much longer, lower cost service and your attention costs will be down to the absolute minimum. Day after day you will experience smooth operation, accurate regulation, elimination of failures and spoilage — plus all this the Streamliner makes a definite contribution toward speedier production results and ends worry and bother that is ordinarily experienced.**

1 Streamlined flow around the inner valve —eliminates turbulence— thereby gives you best control under varying loads.

2 **Straight path for the fluid through the *flow tube* — gives you better pressure control and greater capacity.**

3 The Aspirator gets the inner valve wide open to meet the demand and hold delivery pressure constant.

● ***Send for Bulletin 962 —it gives you the complete story.***

CASH STANDARD CONTROLS.. VALVES

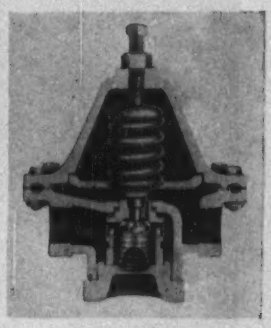
A. W. CASH COMPANY
DECATUR, ILLINOIS

●

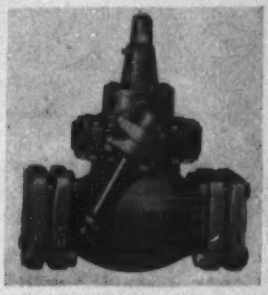
BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

Send for them

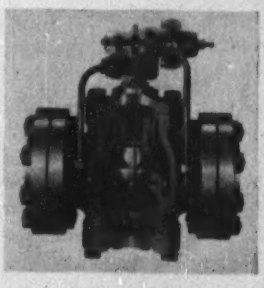
●



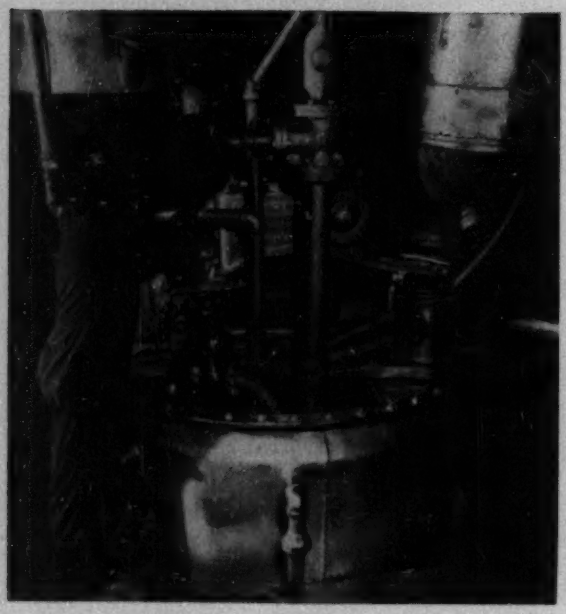
Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



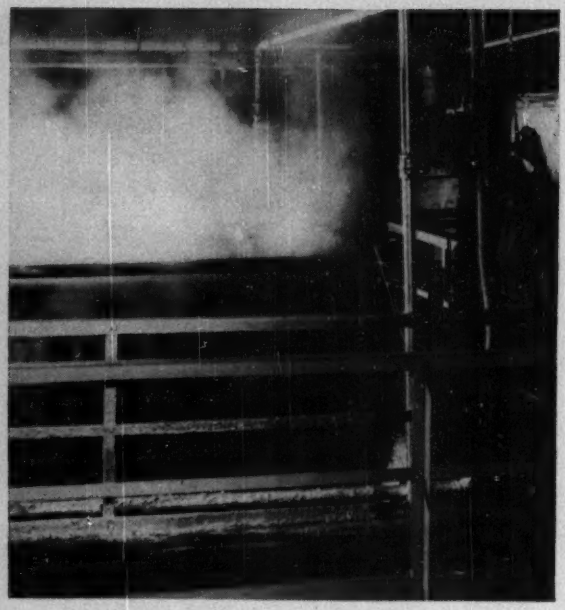
Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.



1 Mixer to which crude cyanide, soda ash, and copperas solution are added to produce crude ferrocyanide solution.



2 Filter which separates waste calcium sulphate and carbonate sludge from the ferrocyanide solution.

Sodium Ferrocyanide

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Potential applications of this promising chemical, now being used principally in the manufacture of iron-blue pigments, await development.

Sodium ferrocyanide is well-known to the trade as "yellow prussiate of soda."

It is used principally in the manufacture of iron-blue pigments—milori blue, prussian blue, chinese blue, etc., but other colored pigments are also possible. Its application in the textile field has fluctuated widely. Currently, it is used as an oxygen carrier in aniline-black dyeing and may be used as a catalyst in the discharge printing of indigo as well as in the development of certain vat dyes. Sodium ferrocyanide has proved of advantage in the inactivation or precipitation of trace metals in fermentation media for the production of organic acids, and in electrolytic tin-plating baths.

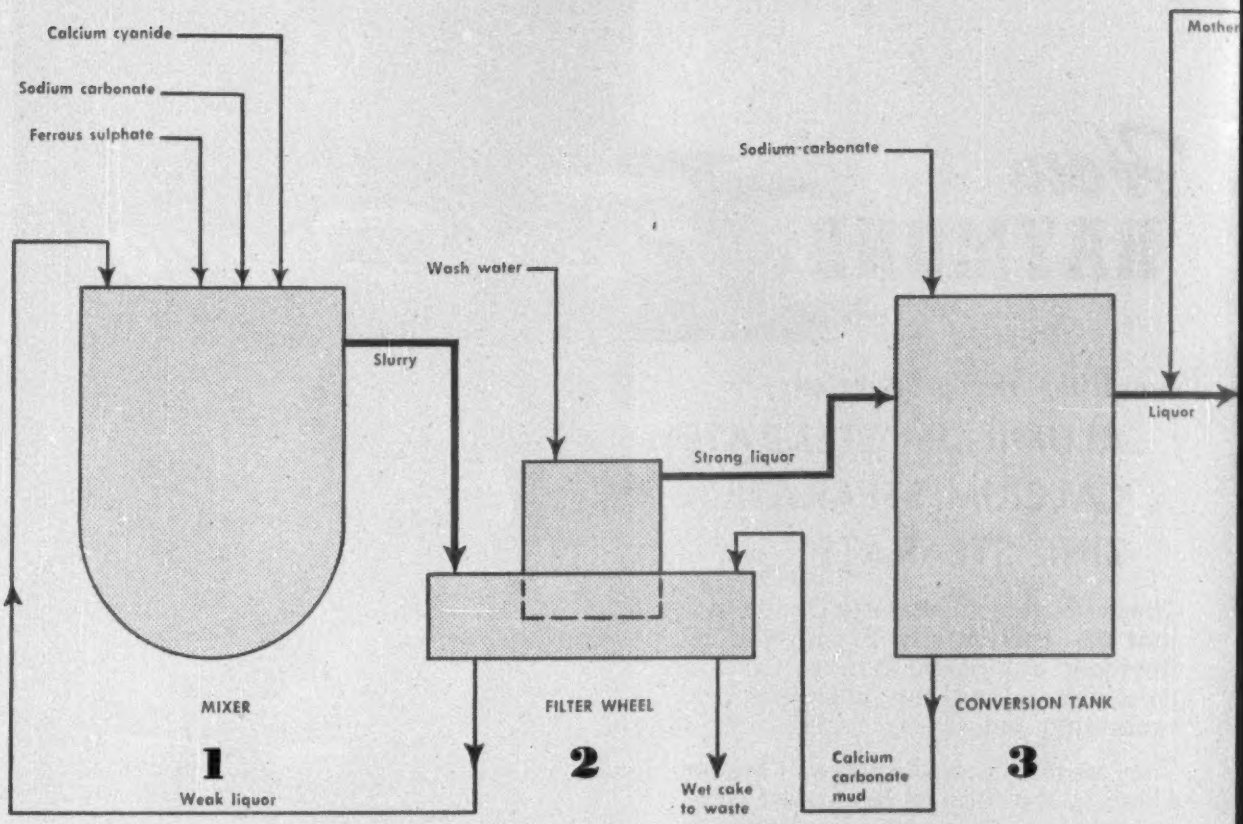
Potential applications are quite diverse and include its use as a low-cost additive to steel pickling baths, as a corrosion inhibitor, and as an aid in the flotation separation of copper, zinc and other ores.

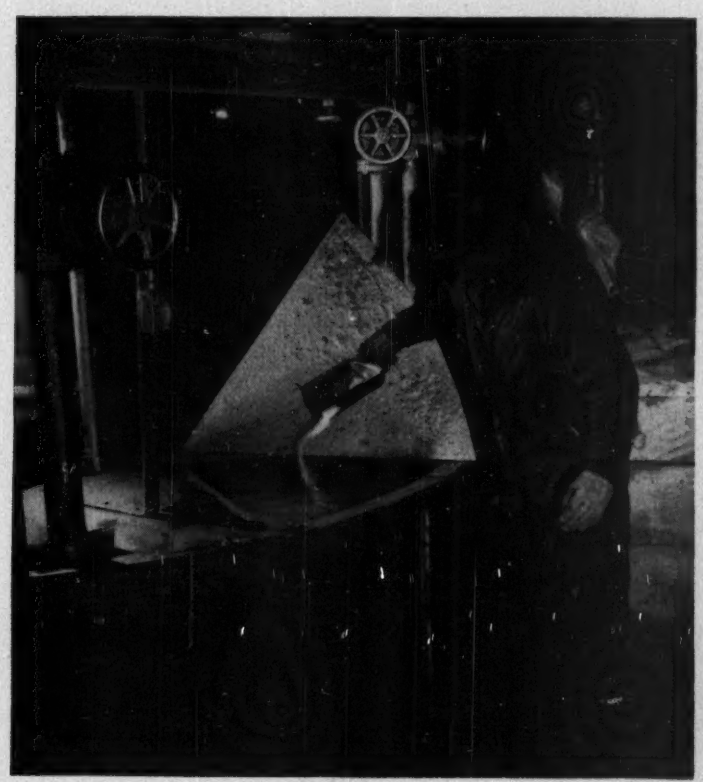
Prior to 1922, production of sodium ferrocyanide was based on the use of byproducts as raw materials. Among these was iron-oxide after its use in the removal of hydrogen cyanide from manufactured gas. In that year, however, American Cyanamid Co. began to utilize its ample supplies of calcium cyanide, and copperas (ferrous sulphate) from sources near its Warners Works. The present process is similar to the one introduced at that time.

Crude calcium cyanide and copperas are blended in solution with soda ash in a mixing kettle. The resulting slurry, containing sodium and calcium ferrocyanides in solution and various insolubles in suspension, is filtered on a rotary filter wheel. The filtrate is treated with more soda ash to precipitate the remaining calcium as the carbonate, which is allowed to settle. The liquor is decanted and is evaporated to the point of incipient crystallization.

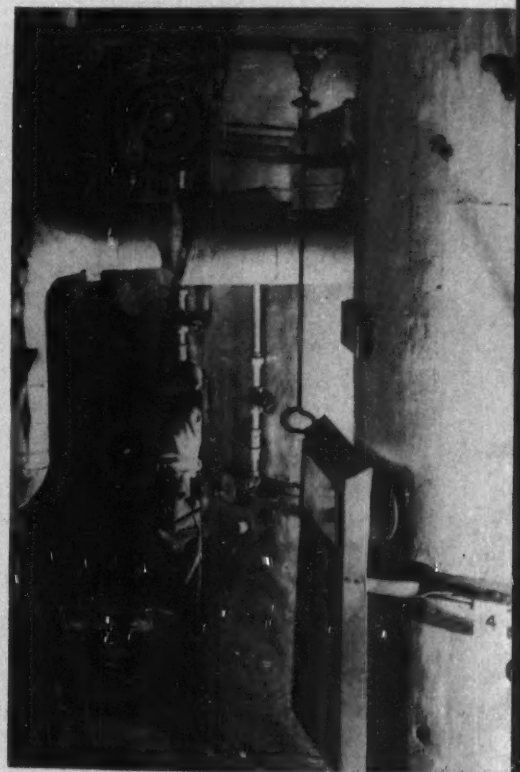
This last operation is completed in large vacuum crystallizers. The wet crystals are redissolved in a mixture of water and recycled mother liquor. The solution is filtered and is sent to a three-stage crystallizer where a fine granular product results. This is separated on a salt wheel filter, sent to a rotary dryer, and then to bagging and storage.

This process represents the production in high tonnage quantities of a complex but highly interesting and very useful chemical.

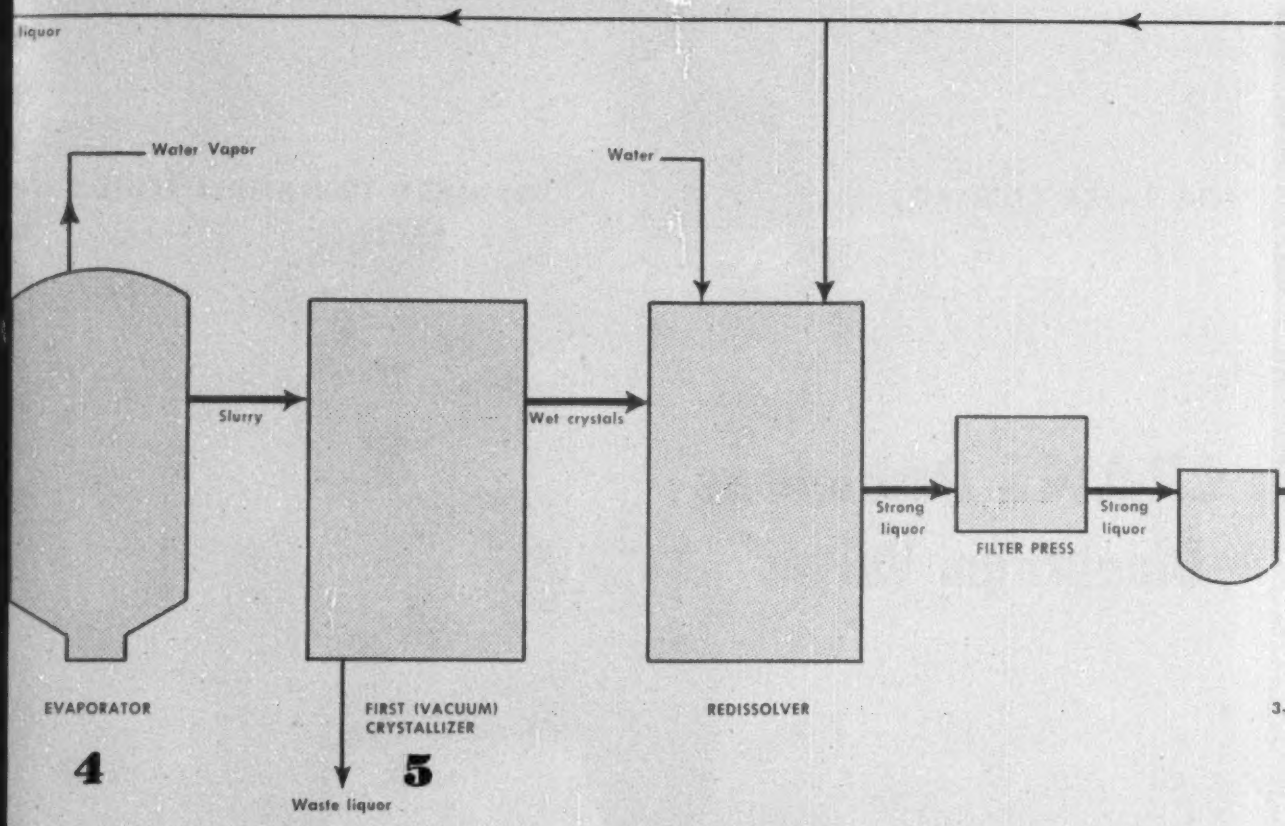




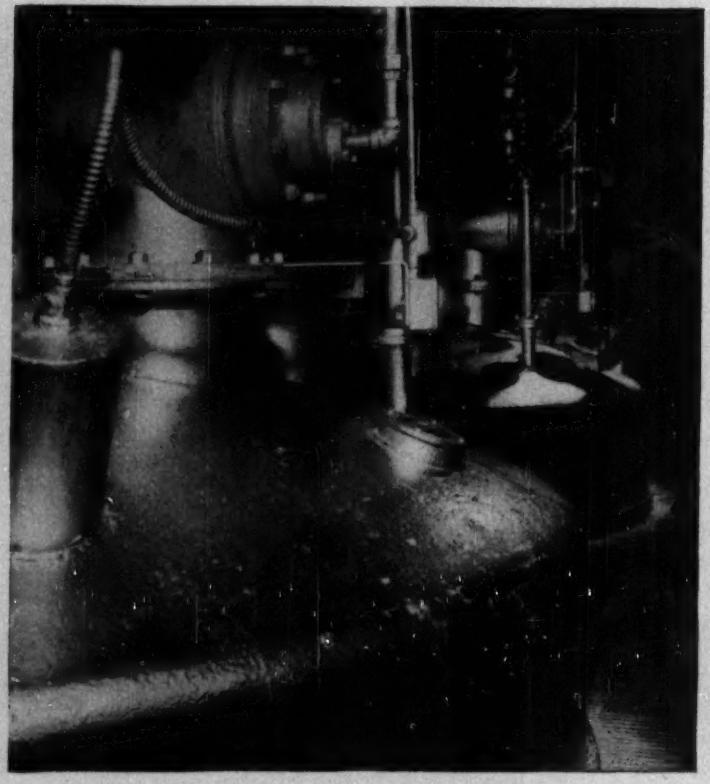
3 Conversion tank in which remaining calcium is precipitated by the addition of soda ash. Clear liquor is decanted after settling.



4 Multiple effect vacuum evaporators where the ferrocy centrated prior to the primary crystallation step.

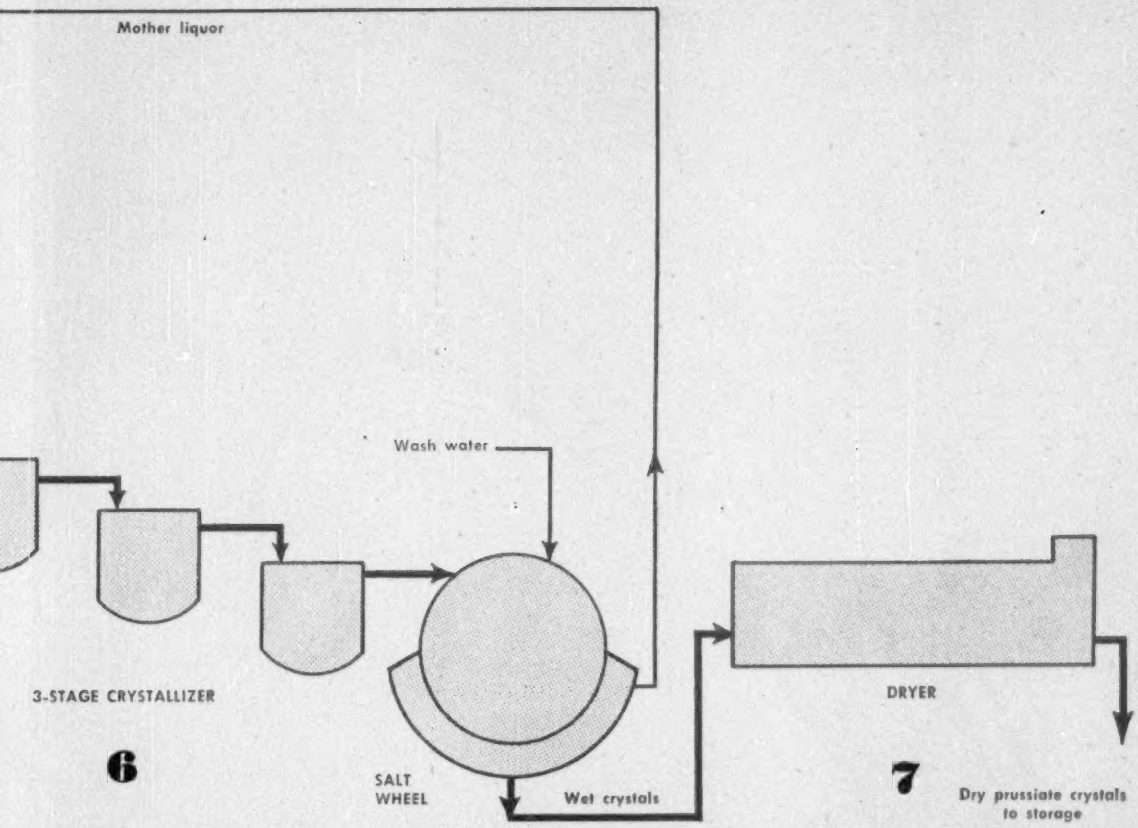


anide solution is con-

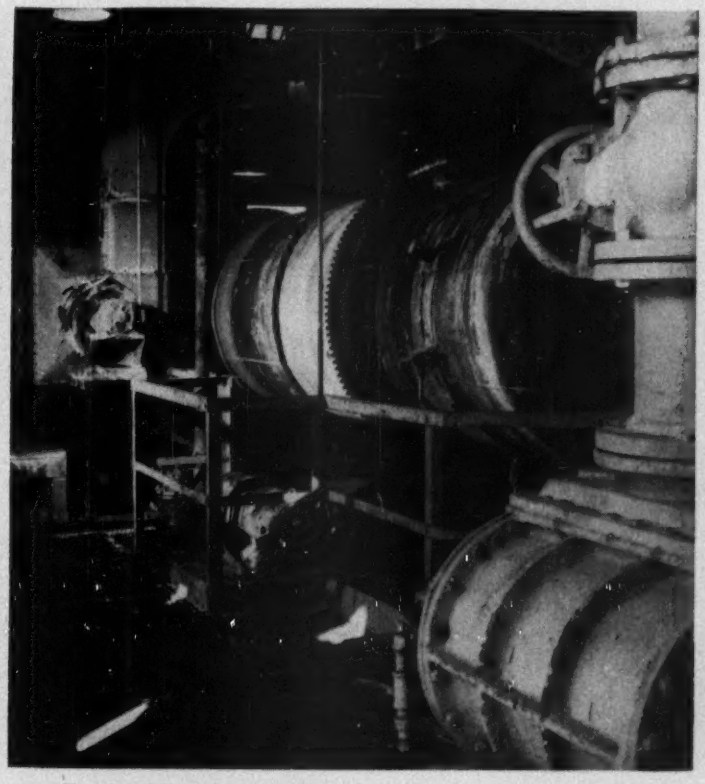


5 Crystallizers where crude, concentrated ferrocyanide solution is cooled by vacuum, precipitating the ferrocyanide crystals.

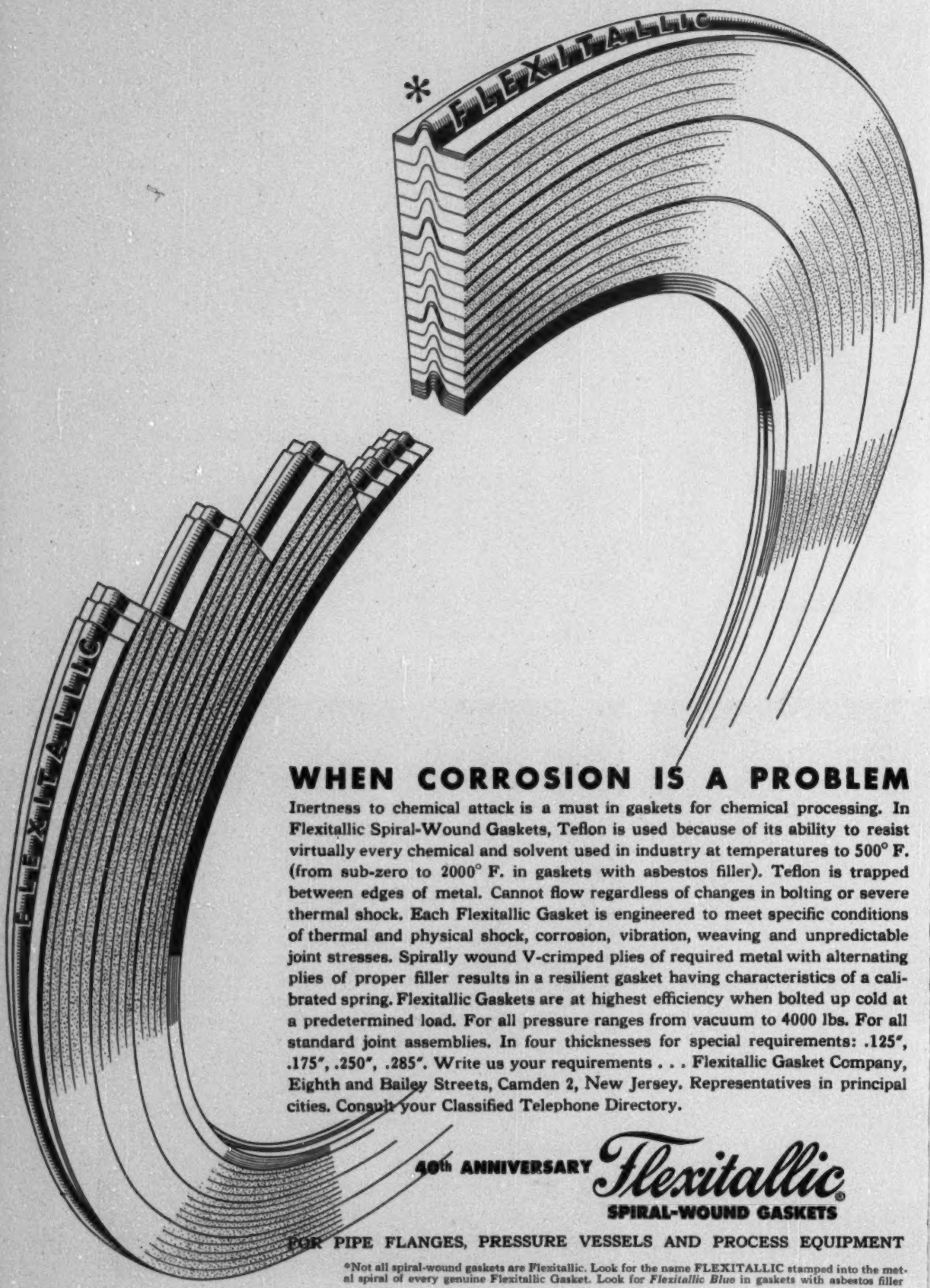
6 Discharge end of the continuous cr crystals and impurities which rem



ous crystallizers handling the slurry of prussiate
remain in solution.



7 Exterior view of the rotary drier where the wet prussiate crystals from the "salt wheel" filter are dried for packing.



WHEN CORROSION IS A PROBLEM

Inertness to chemical attack is a must in gaskets for chemical processing. In Flexitallic Spiral-Wound Gaskets, Teflon is used because of its ability to resist virtually every chemical and solvent used in industry at temperatures to 500° F. (from sub-zero to 2000° F. in gaskets with asbestos filler). Teflon is trapped between edges of metal. Cannot flow regardless of changes in bolting or severe thermal shock. Each Flexitallic Gasket is engineered to meet specific conditions of thermal and physical shock, corrosion, vibration, weaving and unpredictable joint stresses. Spirally wound V-crimped plies of required metal with alternating plies of proper filler results in a resilient gasket having characteristics of a calibrated spring. Flexitallic Gaskets are at highest efficiency when bolted up cold at a predetermined load. For all pressure ranges from vacuum to 4000 lbs. For all standard joint assemblies. In four thicknesses for special requirements: .125", .175", .250", .285". Write us your requirements . . . Flexitallic Gasket Company, Eighth and Bailey Streets, Camden 2, New Jersey. Representatives in principal cities. Consult your Classified Telephone Directory.

40th ANNIVERSARY *Flexitallic*®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Not all spiral-wound gaskets are Flexitallic. Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket. Look for *Flexitallic Blue* in gaskets with asbestos filler

FOR SAFER CONTROL ⟶ OF HARD-TO-HANDLE FLUIDS

CRANE Packless Diaphragm Valves

Now Available in New Materials

WORKING PRESSURES—up to 150 pounds. Water, air, oil, or gas, 180°F. maximum temperature, depending on valve size and materials.

You asked for it—and now Crane gives you this outstanding Diaphragm Valve in a new wide choice of body, disc insert, and diaphragm materials—in unlined or lined patterns. Whichever is specified, Crane design gives you important advantages including—long diaphragm life . . . positive shut-off in case of diaphragm failure . . . less resistance to flow with minimum pressure drop . . . easy operation . . . simplified maintenance at lowest upkeep cost.

Full specification data is in your new Crane 53 Catalog—or ask your Crane Representative.

SCREWED ENDS, UNLINED Sizes ½ to 2 in.
Brass, Cast Iron, Aluminum, or 18-8 Mo body and disc. Furnished with neoprene, Buna N, and natural rubber diaphragm and disc insert.

FLANGED ENDS, UNLINED Sizes ½ to 6 in.
Cast Iron, Aluminum, or 18-8 Mo body and disc. Furnished with neoprene, Buna N, and natural rubber diaphragm and disc insert.

FLANGED ENDS, LINED Sizes 1 to 6 in.
Cast Iron body only. Lined with neoprene or hard natural rubber. Disc coated with neoprene or soft natural rubber.

•

Other body and disc materials, as well as linings, available on special order. Also sliding stem valves for automatic operators of all types.

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

SINCE 1887

How RAYMOND Flash Drying

simplifies the production of

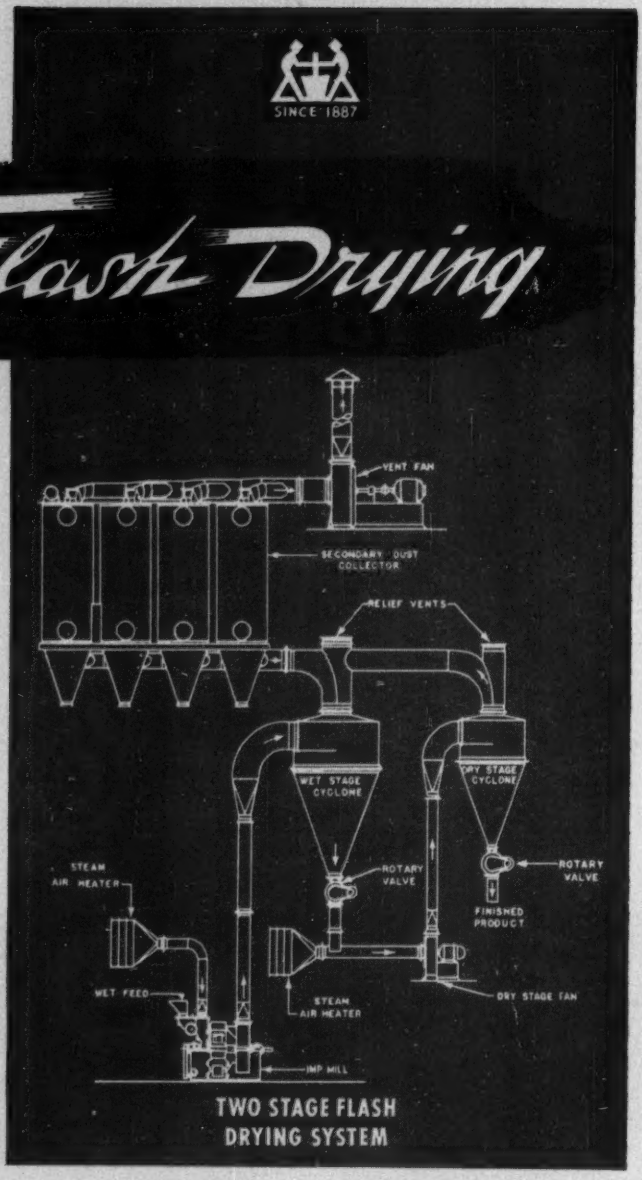
ALUMINUM STEARATE
CALCIUM STEARATE
ZINC STEARATE

These are typical stearate compounds that are successfully Flash-Dried by Raymond equipment in many installations throughout the chemical and processing industries.

They usually come to the mill system either in the form of filter-press cake, or centrifuged materials, containing anywhere from 50% to 70% initial moisture. They are handled through a Two-Stage Flash Drying System as shown by the diagram at the right.

During the first stage, the moisture content is reduced to about 5% and in the final stage to one per cent or under. At the same time, the material is disintegrated in the Imp Mill to a finished fineness of all passing 30-mesh up to 99% or better through 325-mesh.

Since these are heat-sensitive materials, they are safely and economically handled by Flash-Drying. The large volume of air at high velocity, with controlled temperature, and the short time of exposure, are important factors in preventing overheating or contamination of the product.



TWO STAGE FLASH DRYING SYSTEM

Write for your copy Today

RAYMOND Flash Drying CATALOG No. 54A

Refer your drying problem to Raymond

COMBUSTION ENGINEERING – SUPERHEATER, INC.

1311 NORTH BRANCH ST., CHICAGO 22, ILLINOIS

Raymond PULVERIZER DIVISION

SALES OFFICES IN PRINCIPAL CITIES

GUIDED TOUR CONTINUED

YOU AND YOUR JOB

How does your company stack up? **248**

CORROSION FORUM

You, too, can have lead in your plants **264**

NAMES IN THE NEWS

AIChE honors Princeton's Wilhelm **284**

INDUSTRIAL NOTES

Who's doing what among your suppliers **298**

QUOTES, EXTRACTS AND DIGESTS

Where to use synthetic greases **307**
Why Monsanto makes a profit **316**

CHEMICAL ENGINEER'S BOOKSHELF

The real truth about Hoover and the Depression **340**
Your checklist of recent books & pamphlets **344**
New literature from the manufacturers **348**

CHEMICAL ECONOMICS

More chemicals for textiles **359**
Some mighty high industry growth rates **364**

TOMORROW'S TECHNOLOGY

Separate your solid solutions **368**
How silica gel removes aromatics **374**
Your checklist of new patents **376**

READER SERVICE

Chemicals, equipment, services **467**

Are you now an executive-in-training?

One out of every five chemical engineers is! So you'll want to read our story on who's doing what in training young chemical executives. It's based on CE's first-hand survey of 38 companies (*You & Your Job*).

Old, but useful.

That's lead. So here's your chart checklist of how this widely-used metal stands up against 192 chemical corrosives (*Corrosion Forum*).

Use greases . . .

. . . at high temperatures, at low temperatures, to cut down wear. This digest spots the what, where and why of synthetic greases (*Quotes, Extracts & Digests*).

AND—Advertisers' Index preceeds your Reader Service section inside the back cover.

MANAGEMENT courses like the American Management Association's, are enjoying a thumping success, but . . .

Why All the Fuss About Executive Development?

That's the question we recently put to a number of personnel directors. Here's how one of them answered it:

"We've always believed in promotion from within. We never go outside the company for executives unless we're forced to—only trouble is that these days we're forced to too darned often.

"Why? You tell me. We've got 150 engineers who take a back seat to nobody when it comes to brains. Yet turn these same men loose on as simple a job as writing a good letter, or maybe something like delegating half of their work to competent subordinates and the engineer behaves like a bull in a china shop.

"Tough situation? Darned right. But that's not all. Ask these same men what their plans for the future are and most of them will tell you they hope and expect to become executives in the company.

"If we promote these men we have to hoe a pretty tough road while they learn—the hard way—the ABC's of managing people; if we go to the outside for executive talent we cripple morale. The point is that some of these men could have begun to learn the rudiments of management 5, 10 or 20 years ago and they could have been getting management training in small doses all the way along the line. They would have been more efficient in managing their own careers and the company's business years ago, and they'd be ready to fill executive posts right now."

The other personnel people we talked to told us pretty much the same story. Most agreed to a pretty serious "executive development" problem or potential problem. And most were engaged in "doing something about it."

Among 20 companies interviewed after preliminary screening, eight had well-defined formalized programs and eight had well-defined informal programs with formalized programs under consideration. Only four had no definite plans for a formal executive development program.

It adds up to this: If a technical man wants to break into management and if he has any qualifications whatever, now's the time he should make his bid. If he has management talent, his superiors want to use it—or at least to know about it; if he has shortcomings, his superiors want to help him overcome them.

Many industrial relations managers admitted that they've been "flying by the seat of their pants on this executive development stuff." It is into this milieu that the "Director of Training," the "Manager of Executive Development," and the "Management Development Consultant" have come.

Some of these men have started from scratch and done an outstanding job on a company, training top and middle executive replacements, upgrading performance all along the line and giving morale a whopping shot of vitamins. But, in many companies, the attitude was "let's wait and see what the other fellow does."

Actually management development has existed on a haphazard basis in most companies for many years, in the form of the "promotion-from-within" philosophy.

This philosophy affects a potential employee from the day he is first interviewed as a senior in college. Only those men are hired who demonstrate a potential for growth and this po-

for in or out bulk liquid storage

In 5 great markets General American offers you complete bulk liquid storage terminal facilities with no capital investment on your part.

You use modern facilities, pipelines, manifolds, blending equipment.

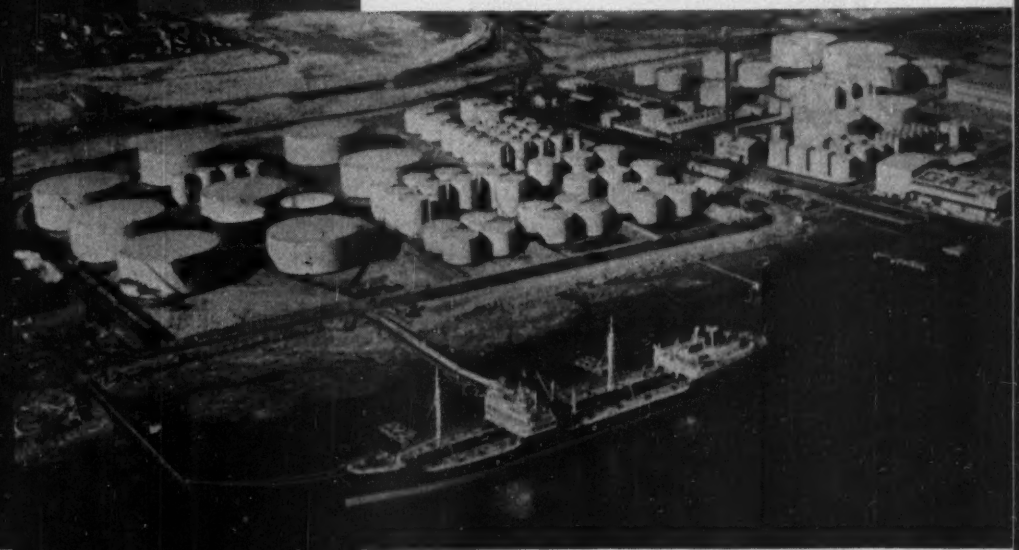
You have complete privacy.

All methods of bulk liquid transportation available.

At the Ports of New York and New Orleans there is high-speed canning, drumming and barrelling equipment—yours to use.

use General American's "for lease" facilities at Port of New York

The heavy, constant flow of petroleum and bulk liquids in-bound and out-bound through the Port of New York reaches almost immeasurable proportions. By tanker traffic alone 2829.4 million lb. of bulk liquids are shipped every month.



GENERAL AMERICAN

TRADE MARK

for dependability, see GENERAL AMERICAN

5 TANK STORAGE TERMINALS

in Important Marketing Centers

- Port of New York (Carteret, N. J.)
- Port of New Orleans (Goodhope, La.)
- Chicago
- Houston
- Corpus Christi

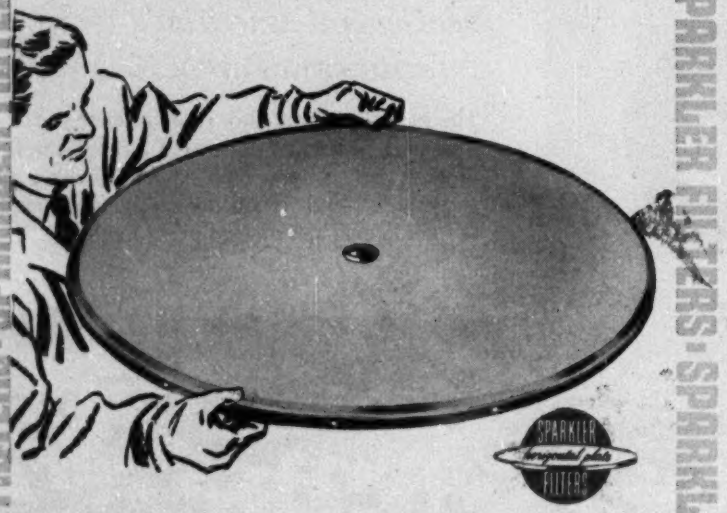
GENERAL AMERICAN TANK STORAGE TERMINALS

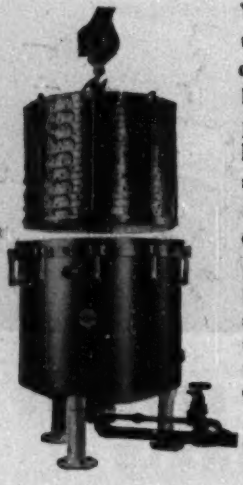
a division of **General American Transportation Corporation**
135 South La Salle Street, Chicago 90, Illinois

SPARKLER FILTERS · SPARKLER FILTERS

SPARKLER FILTERS

Designed to use diatomaceous earth without the necessity of a fibrous material pre-coat to hold cake on the plate.





With Sparkler horizontal plates there is no tensile strain on the cake. Even a very thin cake can be built up without danger of slipping or breaking as it rests in a horizontal position on the plate and requires no pressure to hold it in position. This saves considerable cost in pre-coating.

Sparkler horizontal filter plates can be removed for cleaning in one unit assembly and a clean set lowered into the filter tank immediately. This feature reduces down time to a matter of minutes.

Representatives in all principal cities in the U.S.A.

SPARKLER MANUFACTURING CO.
Mundelein, Ill.

Sparkler International Ltd.
Herengracht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U. S. A.

SPARKLER FILTERS · SPARKLER FILTERS

tential is usually given more weight than are present capabilities.

After such a man is hired, he's usually followed rather closely with annual or semi-annual reviews of his progress. But that's often the end of it and it's here that these "programs" fall down.

Although certain opportunities like night school and university courses, outside reading, work with technical societies, and the like do exist, few men will take advantage of these unless they are pushed. The net result is that both company and man with no real goals, attain nothing. Meanwhile both drift along under the false security of believing that where opportunity to get ahead is present, development will follow.

What has really happened is that some of the brighter young men have become dissatisfied with their progress and have found more alert employers and less talented men have been content to plod along taking little or no advantage of the opportunities offered.

This is the first of several articles on the subject of management development in the chemical and allied products industries. Subsequent articles will deal with the role of a consulting firm in a management development program and with the Management Course of the American Management Association.

Where a formal program exists executive development is "tailored" to the needs of the company and to the needs of the individual.

First, the company's problem is defined. Does it need replacements for top and middle executives—or does it want to upgrade the performance of all its professional and executive personnel, or both? In short, the company sets up a timetable: (a) What do we want to accomplish? (b) How can we do it? (c) How long will it take and what will it cost?

The second step is to decide which men are the best candidates. Then, after selection, the job is to inventory each man chosen, deciding first, what shortcomings have to be overcome before the man can measure up to a defined level of supervision; and second, how best to remove these shortcomings.

The third step boils down to inspiration and guidance. It is only recently that the psychologists have fully realized that you can't teach a

man anything unless he wants to learn.

The job of the training director, then, is to guide and inspire. If a man honestly believes that the only thing standing in the way of his progress is his own intertia, or his own shortcomings, you don't have to lead him by the hand over the tough route to the front office. Just point him in the general direction, point out the less obvious forks in the road, and check his direction at intervals.

But these remarks are rather general. We thought it would be a good idea to set down specifically some of the things that the more progressive companies in our industry are doing about executive development. That story is on the following pages.

Thanks

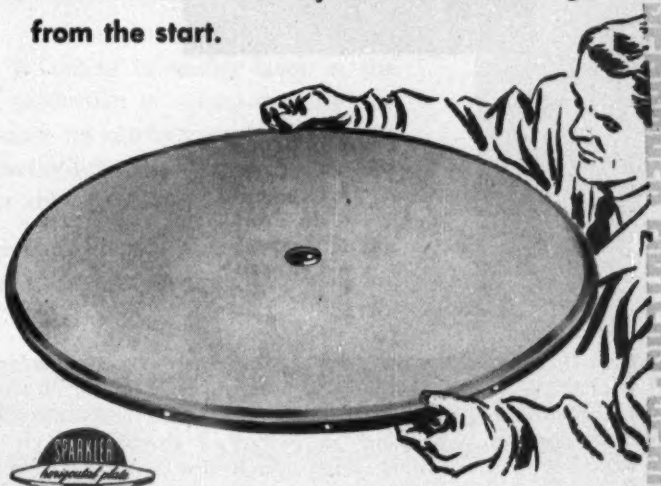
The editor wishes to acknowledge and thank the following men without whose cooperation and help this report would not have been possible:

Murray Owen, coordinator, management development, American Cyanamid Co.; W. L. Stabler, manager, organization planning division, E. I. du Pont de Nemours & Co.; K. B. Bernhardt, manager, executive development, Monsanto Chemical Co.; Richard R. Crow, training director, United States Rubber Co.; C. H. Alexander, staff representative, technical, B. F. Goodrich Chemical Co.; J. William Stuart, director of Industrial relations, Chas. Pfizer & Co.; J. S. Wilson, personnel manager, chemical division, Corn Products Refining Co.; R. B. Shewbridge, industrial relations division, The Davison Chemical Corp.; J. W. Miller, director of personnel administration, Dewey and Almy Chemical Co.; S. L. Starks, director, technical employment, The Dow Chemical Co.; George F. Cooper, technical employment supervisor, Hercules Powder Co.; C. G. Maise, Hoffmann-LaRoche, Inc.; R. R. Harley, office management and personnel, National Gypsum Co.; Fred C. Abbott, manager of personnel, Pennsylvania Salt Manufacturing Co.; T. M. Devine, assistant vice president, Tennessee Eastman Co.; W. R. Philbrook, industrial relations director, Westvaco Chemical Div.; George H. Baker, director, employee and public relations, Wyandotte Chemicals Corp.; Morris I. Pickus, president, Personnel Inst.; Edward Walther, Management Development Associates.

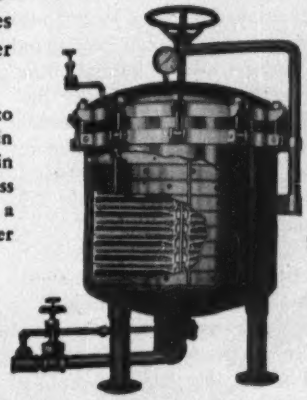
SPARKLER FILTERS · SPARKLER FILTERS

SPARKLER FILTERS

Designed for maximum pre-coat economy. Only a thin pre-coat cake is necessary to assure brilliant clarity of the filtrate right from the start.



Sparkler horizontal plates permit the filter media to be floated onto the plate and deposited with gravity into a cake of uniform thickness and uniform density even though the first pre-coat is very thin. This saves considerable time and Filter Aid in pre-coating.



Since no pressure is needed to hold this thin pre-coat cake in position it is possible to begin filtering operation with less pressure which results in a cake of less density and greater flow rate.

For personal service on your filtering problems, address correspondence to Mr. Eric Anderson

SPARKLER MANUFACTURING CO.
Mundelein, Ill.

Sparkler International Ltd.
Herengraht 568, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill., U. S. A.

SPARKLER FILTERS · SPARKLER FILTERS

Here's What the Chemical Companies Are Doing

These are good examples of . . .

. . . Formal programs

- **Cyanamid**
- **du Pont**
- **Monsanto**
- **Pennsalt**
- **U. S. Rubber**

. . . Informal programs

- **Corn Products**
- **Dow**
- **Hoffmann-La Roche**
- **National Gypsum**
- **Pfizer**

MANAGEMENT development is one of the hottest subjects in the chemical industry today. Many companies have expansion programs "in the works" or on the drawing tables but they don't know where they'll get the managers to run the plants.

▶**New Problem**–Other companies have heard a good deal of talk since the end of World War II about "executive development" but didn't give it much heed–until they looked into their own situation. What they found was disturbing. With normal retirements, deaths and replacements, they were running out of top and middle executives faster than new candidates could–or would–develop themselves. Most of these have decided to "do something about the problem."

But "doing something" has taken different forms in different companies.

With that in mind, CE decided to survey the industry and report on what the more progressive companies have learned about meeting the problem of developing tomorrow's managers from today's engineers.

▶**New Job**–Among the bigger companies, a centrallized group under the direction of a training director or a manager of management development has usually taken over the timetable of executive development.

Broadly, the objectives in companies like Cyanamid, du Pont and Monsanto are: (1) to create a timed reserve of qualified and experienced men from which the most capable and promising can be chosen to fill higher executive vacancies; and (2) to upgrade present performance–to help incumbent executives to meet increasing and diversified responsibilities in their present jobs.

▶**Step 1**–Among companies like these, the first step to a workable executive development program is a comprehensive executive inventory: What do we have now? What do we need?

Cyanamid's action is typical of tackling this first step. Here's what they are doing:

First, the company is finding out "what it has now" with:

1. A comprehensive status form filled out by the employee.

2. A personal interview with the employee, checking information, discussing the man's ambitions and getting to know him.

3. A summary of all the facts on a "Personal Experience Resume."

4. An appraisal of the employee's potential by his supervisors.

This information at Cyanamid is being filed in a central location and kept up to date.

▶**Step 2**–Next in any large company's formal executive development program is a forecast of managerial needs. This usually consists of: a detailed analysis of the existing organization; a forecast toward a more "ideal" organization; position specifications detailing the duties and responsibilities of an incumbent; and a master replacement table (the one shown on p. 254 is Monsanto's).

Monsanto is probably typical of the larger, diversified chemical company. Here's the nature of its problem. When the staff went to work on an executive development program, they found that plans for a 25 percent expansion over the next five years would take an additional executive and administrative staff of 50-60 men. Of Monsanto's present 212 executives, about 70 will retire within 16 years. And average statistics of death and disability are expected to boost this figure. (Only 47 out of every 100 men who reach 50 will stay employed until 65).

Against this forecast is Monsanto's present staff consisting of the following:

• Senior executives–about 70 men. These are senior officers, staff department directors, division general managers and division department di-

NEW LIGHT ON AN OLD SUBJECT*

Bringing new light to bear on the varied uses of

its products is part of Niagara's service to industry.

NIALK® Carbonate of Potash

This potash salt is finding increasing favor in the development and production of special dyes for the textile industry, since its carefully controlled purity and quality are particularly helpful in achieving and maintaining a true color.

Quality plus cooperation keeps NIALK products at the forefront in research and product improvement.

NIAGARA ALKALI COMPANY

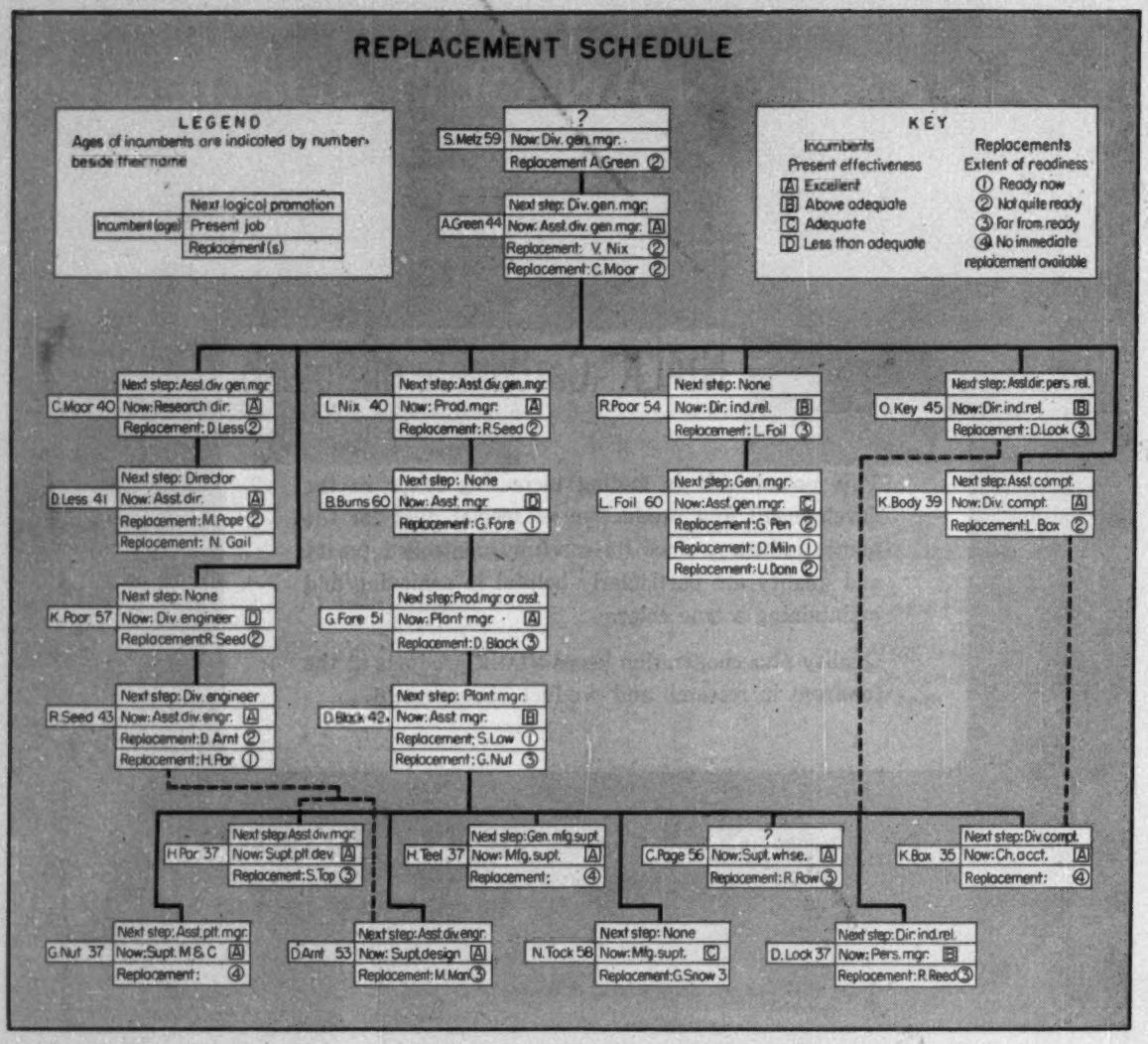
60 East 42nd Street, New York 17, New York

* NIALK LIQUID CHLORINE NIALK CAUSTIC POTASH

NIALK CARBONATE OF POTASH NIALK PARADICHLOROBENZENE

NIALK CAUSTIC SODA NIALK TRICHLORethylene

NIAGATHAL® (TETRACHLORO PHTHALIC ANHYDRIDE)


REPLACEMENT SCHEDULE
LEGEND
Ages of incumbents are indicated by numbers beside their name
Next logical promotion
Incumbent (age) Present job
Replacement (s)
?
S. Metz 59 Now: Div. gen. mgr.
Replacement A. Green ②
A. Green 44 Next step: Div. gen. mgr.
Now: Asst. div. gen. mgr. [A]
Replacement: V. Nix ②
Replacement: C. Moor ②
KEY
Incumbents
Present effectiveness
[A] Excellent
[B] Above adequate
[C] Adequate
[D] Less than adequate
Replacements
Extent of readiness
① Ready now
② Not quite ready
③ Far from ready
④ No immediate replacement available
C. Moor 40 Next step: Asst. div. gen. mgr.
Now: Research dir. [A]
Replacement: D. Less ②
D. Less 41 Next step: Director
Now: Asst. dir. [A]
Replacement: M. Pope ②
Replacement: N. Gail
K. Poor 57 Next step: None
Now: Div. engineer [D]
Replacement: R. Seed ②
R. Seed 43 Next step: Div. engineer
Now: Asst. div. engr. [A]
Replacement: D. Arnt ②
Replacement: H. Por ①
L. Nix 40 Next step: Asst. div. gen. mgr.
Now: Prod. mgr. [A]
Replacement: R. Seed ②
B. Burns 60 Next step: None
Now: Asst. mgr. [D]
Replacement: G. Fore ①
G. Fore 51 Next step: Prod. mgr. or asst.
Now: Plant mgr. [A]
Replacement: D. Black ③
D. Black 42 Next step: Plant mgr.
Now: Asst. mgr. [B]
Replacement: S. Low ①
Replacement: G. Nut ③
R. Poor 54 Next step: None
Now: Dir. ind. rel. [B]
Replacement: L. Foil ③
L. Foil 60 Next step: Gen. mgr.
Now: Asst. gen. mgr. [C]
Replacement: G. Pen ②
Replacement: D. Miln ①
Replacement: U. Donn ②
O. Key 45 Next step: Asst. dir. pers. rel.
Now: Dir. ind. rel. [B]
Replacement: D. Look ③
K. Body 39 Next step: Asst. compt.
Now: Div. compt. [A]
Replacement: L. Box ②
H. Por 37 Next step: Asst. div. mgr.
Now: Supt. plt. dev. [A]
Replacement: S. Top ③
H. Teel 37 Next step: Gen. mfg. supt.
Now: Mfg. supt. [A]
Replacement: ④
C. Page 56 ?
Now: Supt. whse. [A]
Replacement: R. Row ③
K. Box 35 Next step: Div. compt.
Now: Ch. acct. [A]
Replacement: ④
G. Nut 37 Next step: Asst. plt. mgr.
Now: Supt. M & C [A]
Replacement: ④
D. Arnt 53 Next step: Asst. div. engr.
Now: Supt. design [A]
Replacement: M. Man ③
N. Tock 58 Next step: None
Now: Mfg. supt. [C]
Replacement: G. Snow 3
D. Look 37 Next step: Dir. ind. rel.
Now: Pers. mgr. [B]
Replacement: R. Reed ③

REPLACEMENT chart. This one is Monsanto's; it's typical of those used by the larger companies.

rectors (sales, production, research).

• Executive and administrative group—about 150 men—assistant staff department directors, heads of major sections of staff departments, assistant division department directors, sales managers, plant managers, assistant plant managers and general superintendents of the largest plants.

• Supervisory, professional and foreman group—about 2,000 people—heads of sections of division departments, assistant sales managers, group leaders, superintendents, supervisors, assistant supervisors and foremen, and all non-supervisory professional employees.

Participation in the executive development program at Monsanto, as at comparable companies, is confined mostly to men in the second group and to those in the third group who are selected as potential replacements for vacancies in the executive and administrative group.

Nearness to retirement, personality characteristics and other factors will normally exclude many of these 500 and Monsanto estimates that only about 150 men in all will be actively involved in the program.

▶ **Step 3**—Clearly, the job is to get each of these 150 men ready for the next logical promotion. That's the third big step. But this job of actually developing individuals is one which must be put into the hands of the line organization with only general guidance and coordination by the training director or the manager of executive development.

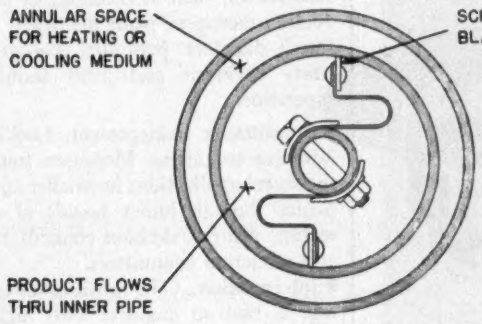
Most of the techniques for developing the individual are well-known and shared by the companies with formal programs. For instance:

▶ **On the job coaching**—This combines observation and learning-by-doing with counseling and is thought to be the best method for developing younger men. In most companies this technique includes appropriate delegation of responsibility, assignments to special projects and committees and other means of broadening the knowledge of subordinates.

▶ **Special trainee positions.** Existing "assistant" and "assistant to" positions with line responsibility wherever possible are used to provide extra experience for trainees. Most companies believe that new jobs of this type can be created where feasible and productive.

Time to Change...

...FROM BATCH TO CONTINUOUS PROCESS



Section thru Double Pipe Exchanger

Scraped Surface Exchanger Unit under test in our shop

Unsurpassed for Top Performance in Processing characterized by:

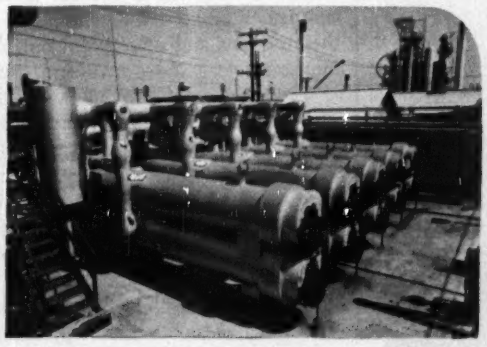
1. Heat transfer with crystallization
2. Heat transfer with severe fouling of surfaces
3. Heat transfer with solvent extraction
4. Heat transfer with continuous mixing and conveying
5. Heat transfer with high viscosity

Chemical processors in search of equipment with which to modernize operations are invited to consider the possibilities of Vogt *flow-thru* Scraped Surface Exchangers in such service. The wide range of uses to which they have been adapted indicates their definite value in the chemical processing fields.

Vogt Scraped Surface Exchangers are closed, *flow-thru,* pressure type systems which permit the use of flammable, volatile and expensive solvents with greatest safety and no danger of solvent loss. Usually fabricated from ferrous material, their simple construction permits the ready use of special materials such as pure nickel or stainless steel to meet special requirements.

General information is in Bulletin PE-1, write for it.

An outdoor installation of Scraped Surface Exchangers

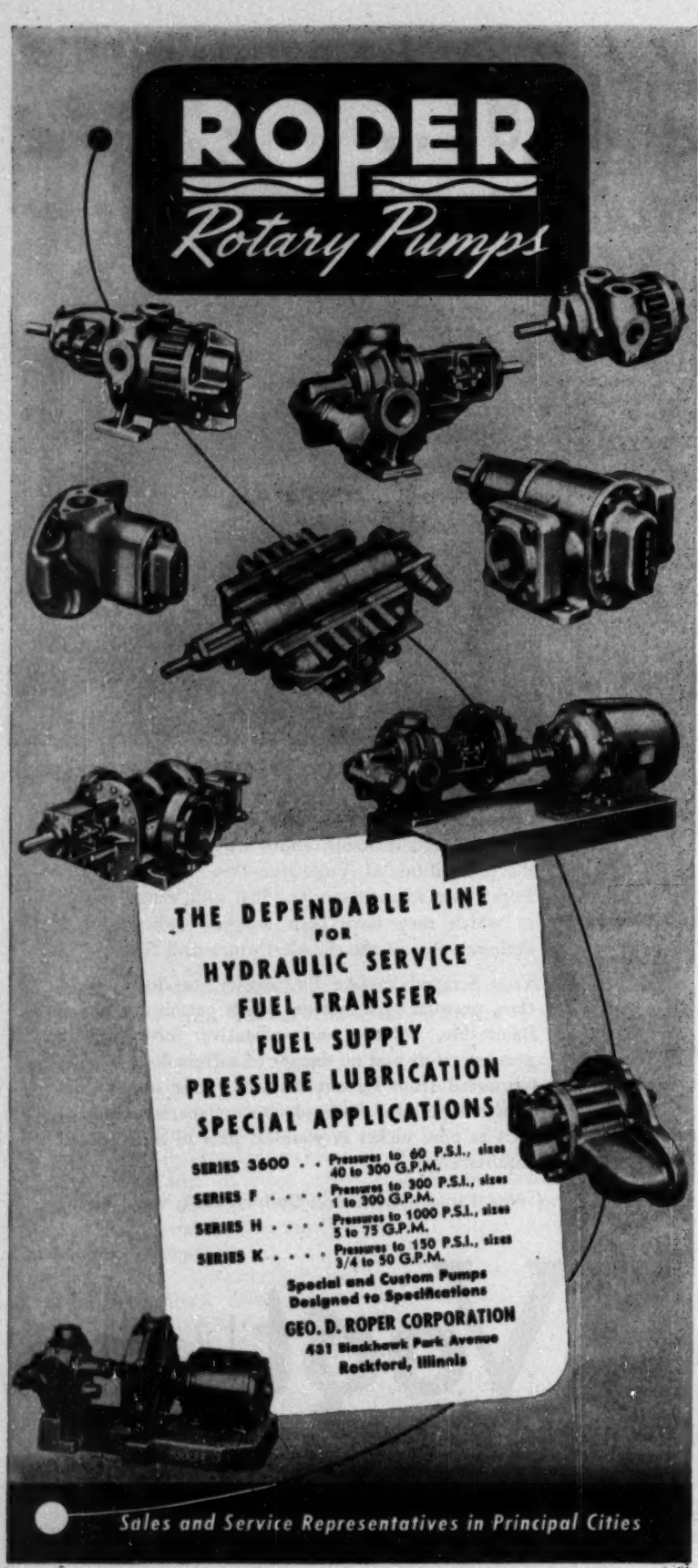


Vogt flow-thru

Scraped Surface EXCHANGERS

HENRY VOGT MACHINE CO.
LOUISVILLE, KY.

BRANCH OFFICES:
New York, Philadelphia, Chicago, Cleveland
St. Louis, Dallas, Charleston, W. Va.


ROPER
Rotary Pumps
THE DEPENDABLE LINE
FOR
HYDRAULIC SERVICE
FUEL TRANSFER
FUEL SUPPLY
PRESSURE LUBRICATION
SPECIAL APPLICATIONS
SERIES 3600 . . Pressures to 60 P.S.I., sizes 40 to 300 G.P.M.
SERIES F . . . . Pressures to 300 P.S.I., sizes 1 to 300 G.P.M.
SERIES H . . . . Pressures to 1000 P.S.I., sizes 5 to 75 G.P.M.
SERIES K . . . . Pressures to 150 P.S.I., sizes 3/4 to 50 G.P.M.
Special and Custom Pumps Designed to Specifications
GEO. D. ROPER CORPORATION
481 Blackhawk Park Avenue
Rockford, Illinois
Sales and Service Representatives in Principal Cities

▶ **Advanced university courses.** Many companies report success with such training as given in the Advanced Management program at the Harvard Business School and similar programs elsewhere.

▶ **Conference leadership and speaking assignments.** Monsanto, for instance, believes that participants in the executive development program should be utilized on a rotating basis to lead (or to act as secretaries of) company conferences, such as meetings of production managers, plant managers, research directors, personnel managers, safety engineers and plant training supervisors.

▶ **Consultative management.** Looking into this technique, Monsanto found successful applications in smaller companies through junior boards of directors, plant or division councils and cost reduction committees.

▶ **Job rotation.** The obvious advantage is that an engineer with highly specialized experience might find this specialization a handicap to future progress in an administrative job. Such men may be selected for short-term assignment to administrative jobs.

▶ **Technical societies** and conferences. Active participation is encouraged.

These techniques, based on Monsanto's program, hold pretty generally for the other large and diversified chemical firms. Any or all of these techniques are used depending on the needs of the individual.

In the area of checking progress of the trainee, du Pont has, perhaps, the most comprehensive plan. A particular feature of du Pont's checks is a step-ladder progression chart to plot the progress of those employees considered to have top-level management potential. Purpose is to be sure that these men may attain such positions at a satisfactory age.

On the negative side most of the companies admit to weak points in their systems and some point out the more obvious pitfalls.

The point mentioned most was the inconsistency of employee performance appraisals. Most companies would give a lot to find a real scientific appraisal method. Besides, the best and most productive workers don't always make the best executives; in fact they're often the worst.

Under the heading "precautions" Monsanto has some good tips:

hot liquids

corrosives

acids

Buy **WILFLEY** *for cost saving performance*

Companion to the famous **WILFLEY** *Sand Pump*

• For more efficient performance... greater economy of operation... specify WILFLEY "AF" Acid Pumps. Dependable, trouble-free operation, on a round-the-clock schedule, with consequent stepped-up production and worthwhile power savings, are big reasons why modern chemical and processing plants all over the world now rely on WILFLEY Acid Pumps for handling acids, corrosives, hot liquids and mild abrasives.

• Available in 10- to 2,000-G.P.M. capacities, 15- to 150-ft. heads and higher. Wetted parts of practically all machineable alloys. Plastic lined models available. Every application individually engineered. Write or wire for details.

WILFLEY *Acid* **PUMPS**

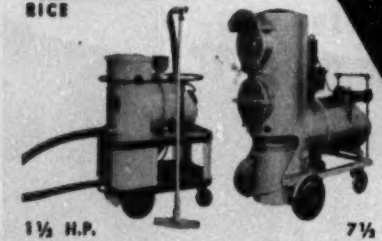
A. R. WILFLEY & SONS, Inc., Denver, Colorado, U.S.A.

New York Office: 1775 Broadway • New York City

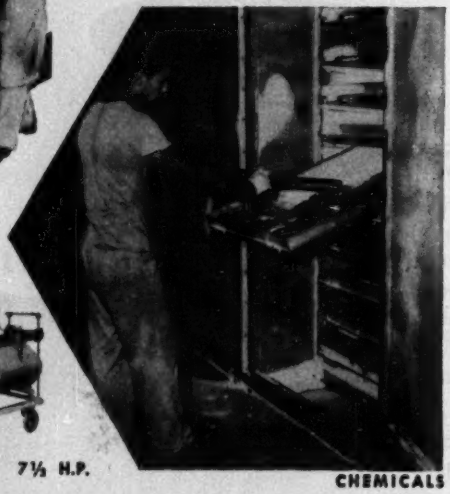
SPENCER VACUUM IN *Food and Chemical* INDUSTRIES

for CONVEYING · INSECT CONTROL · PACKAGING PRODUCTION · RECOVERY SANITATION

RICE



1½ H.P. 7½ H.P.



CHEMICALS

The time required for moving, cleaning, sorting and packaging valuable foods and chemicals has been materially reduced by Spencer Vacuum. Rice and powdered chemicals are handled by the ton. Excess powdered sugar is recovered from chocolate candies, the insect hazard removed at its source and the entire plant made continuously sanitary as an extra dividend, with the same Spencer machine.

Large areas, inaccessible spots in machines and tanks, above pipes and behind radiators are cleaned quickly with powerful vacuum tools. A Spencer size and vacuum tool for every purpose, including offices, boiler rooms and warehouses. Ask for the Bulletins.

427-A

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

YOU AND YOUR JOB, cont. . .

- Keep the program as simple as possible;
- See that the program is actively supported by top management;
- Begin slowly and proceed step-by-step along well considered lines; (Cyanamid's program will undergo a "pilot" trial at various plants, including Stamford, to work out any "bugs" and reasonably ascertain its chances for success on a full-scale);
- Don't expect immediate results—it's a long-term process;
- Keep ages of participants low as possible consistent with the levels of the positions to be filled;
- Treat all participants as individuals at all times;
- Don't make any promises to participants;
- Keep all records absolutely confidential;
- Do not publicly identify participants (all upper level employees are considered and watched).

Besides filling obvious needs, executive development programs offer secondary advantages, too, things like: increase in promotion-from-within; improvement in management morale; ability to staff new operations; guidance for recruiting; better placement of management people; and assistance in top management personnel planning.

In smaller companies the problem is quite a bit different. Obviously the elaborate centralized personnel inventories may not be necessary but it's equally obvious that the "drift along" policies don't encourage personal efficiency, don't produce high morale and certainly don't turn out many executives.

That's why the majority of medium-sized chemical and allied companies too are looking into formalized programs.

Here are the plans of some of them:

B. F. Goodrich

This company is quite interested in a definite program of executive development and hopes to have one within a year.

Chas. Pfizer

Here a formal program is in its initial stages.

It's a four point program aimed at sharpening supervisors and executives in four areas: (1) knowledge of the company-history, policies, plans; (2)

administration knowledge and skill; (3) technical knowledge and skill; and (4) human relations knowledge and skill.

Items one and four are taken up first, covered in a formal training program of regularly scheduled discussion groups led by company executives. After proficiency here, item two is taken up. Item three is aimed at keeping men up on the extremely rapid technological changes in the chemical industry.

Corn Products Refining Co.

Here, a three-point program is used:

- On the job training with frequent changes in assignment.
- Less frequent changes for experienced men, with careful, thorough, annual merit rating.
- Maximum use of line and staff assistants by department heads.

After 15 years of experience with one kind of training program or another the company has decided that this flexible, productive type of training beats the formal, almost rigid programs usually used.

Dow

No formal program here but an extensive on-the-job training program for supervisors moved to executive spots.

Hoffmann-La-Roche

This company has put its program into the hands of the Personnel Institute and Management Development Associates in New York. This combined firm of consultants is conducting a program that is known as the Management Achievement program.

National Gypsum

An informal supervisory and management training program which uses:

- Organization manual.
- Personnel manual.
- Department manager's meetings.
- Leadership in extra-curricular activities.
- Limited use of films.
- Limited orientation program.
- Trade and professional organizations.
- Trade and personnel literature.
- Fostering of night school work.
- Performance reviews.
- Day to day contacts.
- Management letters.

In addition, a more formal training program is being considered for all levels of management.

AUTO-LITE

... for Temperature Indication

3-way adjustable mounting

Model F-1 temperature indicator

Auto-Lite offers many thermometer styles, permitting plant-wide temperature observation at low cost. Standard temperature ranges from minus 60°F to plus 750°F. Send for latest catalog showing various types.

Rigid stem or capillary tubing for EYE-LEVEL remote reading. Priced from $22.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

TEMPERATURE INDICATORS & RECORDERS

QUALITY *in* QUANTITY

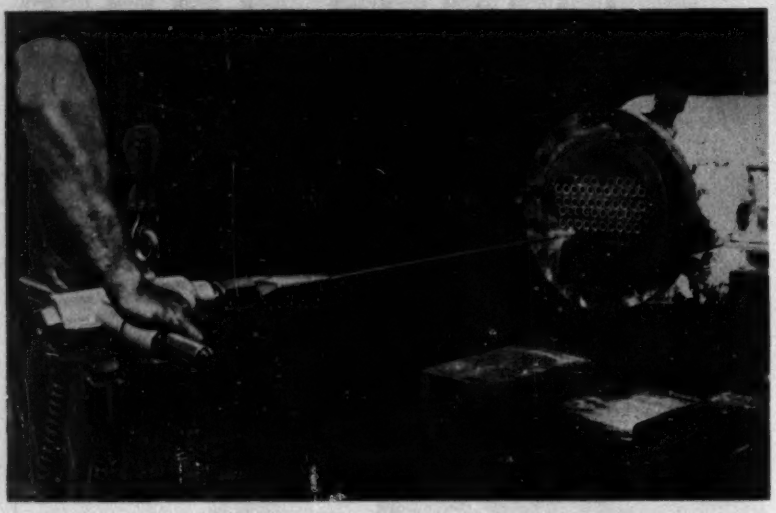
As the largest producer of chlorates and perchlorates WECCO is proud of its record of producing chemicals of unexcelled quality in large scale operation. Check and compare the purity of WECCO'S products and you will find them at the top regardless of whether you sample a cup or a carload.

Western

Manufacturers of Chlorates, Perchlorates and Manganese Chemicals

ELECTROCHEMICAL COMPANY
Plant and Sales Office • HENDERSON, NEVADA Box 55
Executive Offices • 9036 Culver Boulevard
CULVER CITY, CALIFORNIA Box 472

MORE POWER
cleans fouled tubes faster



WILSON
MODEL TP-301
TUBE CLEANER
offers all these features:

- More powerful
- Lighter weight—only 15 lb
- Shorter—only 13" overall
- Increased capacity—from ⅜" up to 2½" or even 3" OD tubes
- Will operate on air pressure as low as 50 lb
- Costs less than previous models

Here is the fastest, most economical tube cleaner on the market for refinery and process heat exchangers. The Wilson Model TP-301 is the only tube cleaner which can immediately remove deposits from completely plugged heat exchanger tubes. No matter how badly tubes are fouled, the Model TP-301 puts equipment back "on stream" with a minimum of manpower and a few hours work. • Use this high speed tube cleaner to step up profits, increase output and minimize downtime. •

WRITE FOR BULLETIN TW-1046

Representatives in all principal cities

THOMAS C. WILSON, INC.
21-11 44th AVENUE, LONG ISLAND CITY 1, N. Y.
Cable Address: "Tubeclean" New York

Various carbide bits available
(Special Bits for Smaller Sizes)

TYPE M BIT

An inserted two lip Helix type for general use 21/64" to 1 17/32" OD.

SPE-DUR BIT

A straight flute type negative rake angle. A good three lip "chipper" for very hard deposits. 11/32" to 1 3/16" OD.

TYPE K BIT

A two lip Helix type with adaptor for general use. 1¼" to 2¾" OD.

WILSON
TW 658A
TUBE CLEANERS • TUBE EXPANDERS

YOU AND YOUR JOB, cont. . .

Pennsalt

This company has recently taken on a director of training, created a central management development council as a policy making body and has organized a training committee as the coordinating agency.

Until recently Pennsalt's efforts were confined largely to on-the-job training, supervisory training and a semi-formal program for graduates.

The company's new plan banks on continued emphasis for on-the-job training, individual counselling and guided programs for self-improvement. The over-all aim will be to strengthen supervisory and management people in: (1) human relations skills, administrative skills, company information and technical skills when appropriate.

Tennessee Eastman

A supervisory training program is operating.

Tennessee Eastman also assists and cooperates in trade and industry courses arranged by the University of Tennessee Extension division.

The company does not have a formal executive development program but is interested in the subject and expects to adopt one in the near future.

Westvaco

This chemical division of Food Machinery and Chemical Corp. is currently formulating a definite program which it expects to present in the near future.

Wyandotte

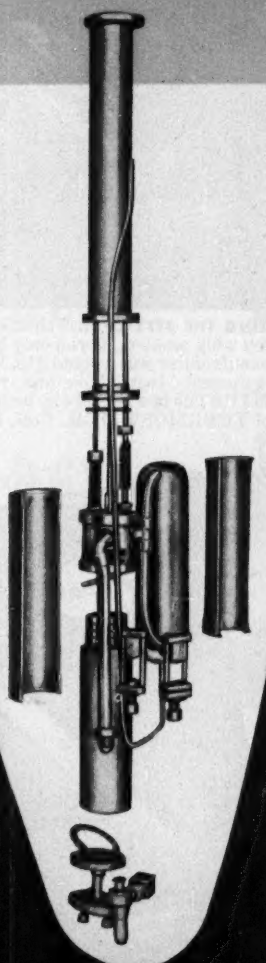
This is one more company which has recognized the importance of developing future executives. Right now Wyandotte is just beginning such a program.

All of the foregoing material may give the impression that everybody is interested in management development. This is not strictly true.

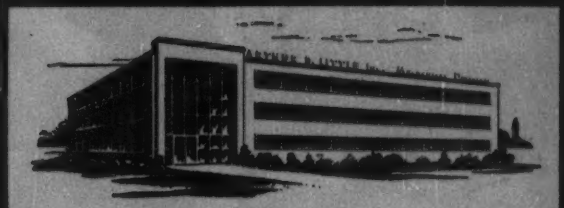
A few rugged individualists expressed the opinion that all was "sound and fury," that formal plans were little more than "studied programs in mediocrity," that "executive potential in outstanding young engineers will assert itself without the catalysis of so-called formalized plans," and that "the dearth of young executive talent is only a figment of the imagination of pseudo-executives who never found out how to delegate most of their responsibilities." —*End*

UNIQUE
PROTOTYPE DEVELOPMENT

. . . using advanced Engineering Techniques



Designing expansion engines for gas liquefaction equipment to operate at *four hundred and fifty degrees below zero Fahrenheit* has its problems — lubrication is just one, contamination and isentropic efficiency, some others. Experience in many areas of engineering metallurgy and physics enabled ADL to design and produce expansion engines which greatly advanced this art.
ADL has the range of experience to develop such unique prototypes and world wide reputation for doing it successfully.



New ADL Mechanical Division Building

IF lack of personnel has halted development of your new ideas or new products, the ADL Mechanical Division can take over and bring them to complete maturity.

Arthur D. Little, Inc., has blended its scientific and engineering skills in the Mechanical Division to provide industry with a unique service . . . prototype development of equipment requiring a high level of engineering. Scientists in the fields of chemistry, physics, metallurgy, mathematics, biology, electronics and technical economics can be called on as required.

Our staff is experienced in interpreting the ideas of industry and following through with the perfection of specialized equipment.

THERMODYNAMICS • HEAT TRANSFER • REFRIGERATION TO MINUS 456 F. • VACUUM ENGINEERING • GAS LIQUEFACTION • ELECTROMAGNETISM • MECHANICAL DESIGN • VIBRATION

Write for Brochure CE 18-1

MECHANICAL DIVISION

Arthur D. Little, Inc.

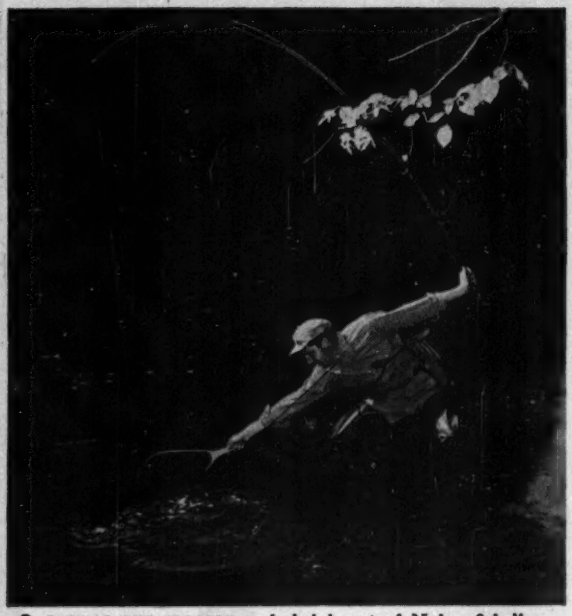
CREATIVE TECHNOLOGY SINCE 1886

ADL Mechanical Division

30 MEMORIAL DRIVE, CAMBRIDGE 42, MASS.

How would YOU solve these 2 problems?

1. IN SOFTBALL MANUFACTURE the most troublesome problem was to obtain absolute uniformity in the kapok cores. These determined hardness, density and shape of the finished balls. H. Harwood & Sons, Inc., of Natick, Mass. solved this problem by molding the cores under hydraulic pressure at closely controlled high temperature. Two inexpensive THERMOSWITCH units per mold provide the needed temperature control at low cost.



2. TAKING THE STRETCH and shrink out of Nylon fish line posed a big problem. It can only be done under high heat. One manufacturer was quoted $18,000 for complicated control equipment. Instead — and very successfully — he stretches the line in a heated die, temperature-controlled by a Fenwal THERMOSWITCH. Cost, less than $25!

3. THIS IS IT — the Fenwal THERMOSWITCH control is simple — compact shell contracts or expands *instantly* with temperature changes, opening or closing electrical contacts. Adjustable and highly resistant to shock and vibration. Fenwal THERMOSWITCH units are solving temperature control problems and improving production throughout all industry.

4. SEND FOR THIS NEW CATALOG for complete explanation of the unique THERMOSWITCH unit. Also ask for more detailed, illustrated discussions of the problems above. Fenwal engineers will be glad to help you solve your temperature control problems involving heat, humidity, radiant heat, pressure and other variables. Write **Fenwal Incorporated, 162 Pleasant Street, Ashland, Massachusetts.**

Fenwal

THERMOSWITCH®

Electric Temperature Control and Detection Devices

SENSITIVE . . . but only to heat

VACUUM FACTS

It's a FACT...

...Kinney originated the rotating plunger vacuum pump... universally acclaimed for fast pump down and quick recovery.

It's a FACT...

...Kinney pioneered the oil-sealed pumping system.

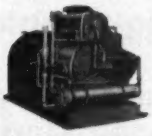
It's a FACT...

...Kinney is the BIG LINE of mechanical vacuum pumps... more models, more sizes, more capacities to choose from.

It's a FACT...

...Only Kinney offers in such a wide range both single stage and compound vacuum pumps — for creating and maintaining low absolute pressures alone or with diffusion pumps.

It's a FACT...



...More vacuum processes depend on Kinney Vacuum Pumps than on any other make or type of pump.

Find out for yourself how Kinney Vacuum Pumps can help in your low pressure processes — in laboratory, pilot plant, or production.

Send coupon or write for details.

Kinney

Kinney Manufacturing Co., Boston 30, Mass. Representatives in New York, Chicago, Detroit, Cleveland, Atlanta, Philadelphia, Pittsburgh, Johnstown (Pa.), Los Angeles, Charleston (W. Va.), Houston, New Orleans, San Francisco, Seattle and foreign countries.

KINNEY MANUFACTURING CO.
3551 Washington St., Boston 30, Mass.

Please send new Bulletin V-51B. Our vacuum problem involves:

☐ Vacuum drying ☐ Vacuum coating ☐ Vacuum metallurgy
☐ Vacuum impregnating ☐ Vacuum distillation ☐ Vacuum research

Name.....
Company.....
Address.....
City..... State.....

SUBSIDIARY OF THE NEW YORK AIR BRAKE CO.

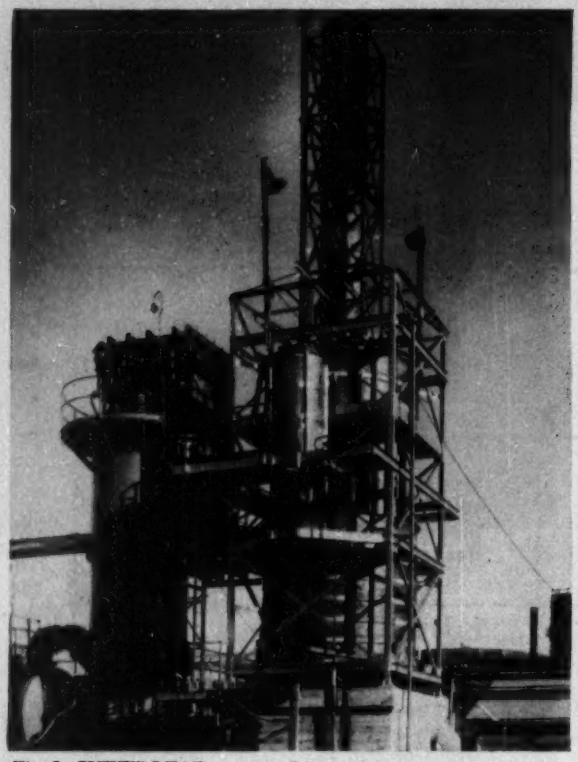


Fig. 1—SHEET LEAD supported in steel framework

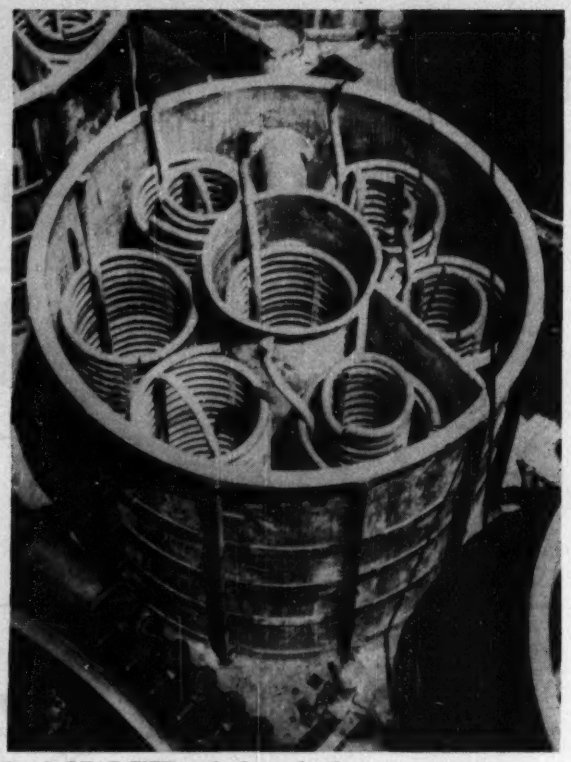


Fig. 2—LEAD PIPE in the form of coils

Lead and Lead Alloys

The corrosion resistance of these materials of construction to a number of corrosives, with forms available, fabrication, and applications in the CPI.

KEMPTON H. ROLL
Lead Industries Association, New York, N. Y.

More than one-third of the lead consumed each year in the United States is used for the prevention of corrosion.

Lead and many of its alloys are widely used in the construction of equipment for the production, transmission, storage and use of a variety of corrosive chemicals. Despite the development of other materials to compete with lead in these applications, its use for corrosives handling has continued to expand. This is partly due to the inherent desirable characteristics of lead as a corrosion resistant material, but it is also due to the experience gained from long and varied use of lead in this field. This experience has taught where and how lead may be used to best advantage and has resulted in improvements in construction and installation methods which have kept pace with developments in the chemical process industries.

Specifications*

	Chemical Lead	Acid Lead	Copper Lead
Ag: max.	0.020	0.002	0.020
min.	0.002		
Cu: max.	0.080	0.080	0.080
min.	0.040	0.040	0.040
As, Sb, Sn—max:	0.002	0.002	0.015
Zn: max.	0.001	0.001	0.002
Fe: max.	0.002	0.002	0.002
Bi: max.	0.005	0.025	0.10
Lead: min.	99.90	99.90	99.85

*A. S. T. M. Standard Designation (B-29-49) for pig lead.

Grades generally specified for chemical construction are chemical lead, acid lead or copper lead. They contain small percentages of silver and copper which have been found to add to the corrosion resistance of lead and to improve its creep and fatigue resistance.

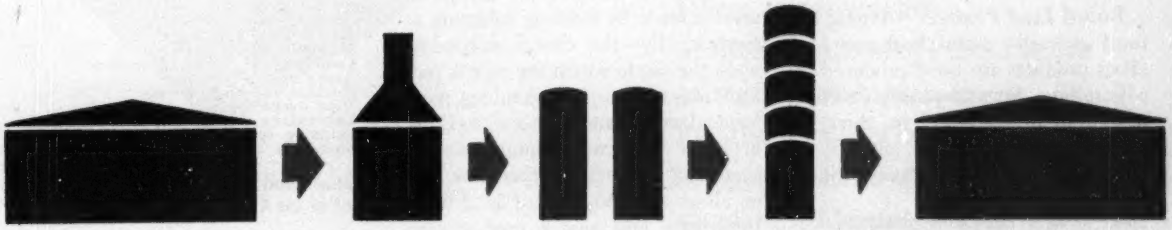
CORROSION RESISTANT ALLOYS

Antimonial Lead—Antimonial or hard lead is lead generally containing from 1 to 12 percent antimony, usually about 6 to 8 percent. Antimony hardens and improves lead's physical characteristics up to about the boiling point of water. However, it lowers the melting point and, while it may not detract from lead's corrosion resistance, seldom does it improve it.

Tellurium Lead—Tellurium lead is chemical lead to which has been added about 0.04 percent tellurium. In extruded lead products, the presence of tellurium retards grain growth and increases fatigue resistance. Corrosion

ROOSEVELT NAPHTHAS

Roosevelt Naphthas are catalytically desulphurized to produce non-corrosive, chemically stable solvents with no offensive odor. And you can be sure of a constant supply of these uniformly high quality Naphthas from Roosevelt. Order standard solvents from our book of specifications or write us about your special requirements.



54

ROOSEVELT OIL AND REFINING CORP. MT. PLEASANT, MICHIGAN

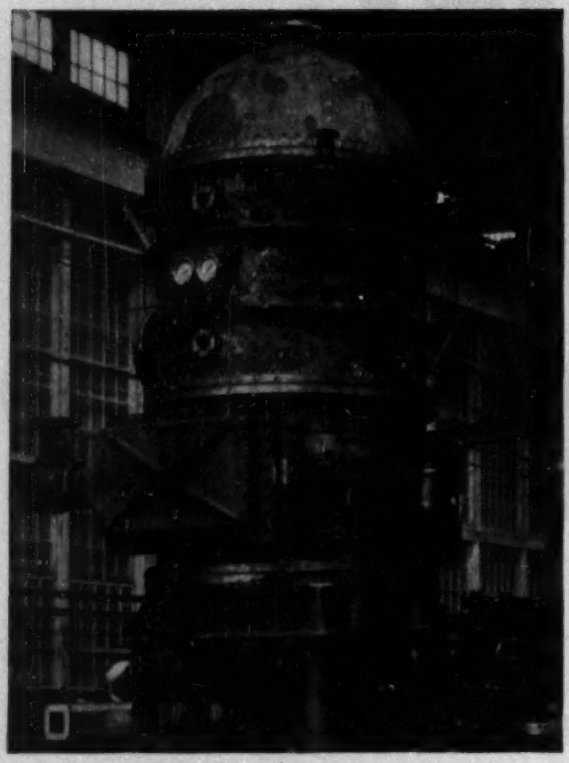


Fig. 3—CAST LEAD evaporator (8 percent antimonial lead)

Fig. 4—LEAD CLADDING bonded directly to steel

resistance is comparable to chemical lead and in some instances is superior.

Other Alloys—There are several other lead base alloys that have been developed for handling special corrosives or for meeting special conditions of exposure. These include tellurium antimonial lead, 7 percent tin lead, calcium lead and others containing silver or other elements in fractional percentages. A number of these are proprietary and should be used in accordance with the recommendations of their manufacturers.

FORMS

Rolled Lead Products—Among the most generally useful lead and lead alloys products are those produced by cold rolling. Sizes may range in thickness from foil, 0.00035 in. thick, to sheet 2 in. thick or more, and may be rolled to any desired thickness. Sheet lead weighs approximately 1 lb. per sq. ft. for each $\frac{1}{64}$ in. of thickness.

Sheet Lead Weight and Thickness

Approx. Lb. Per Sq. Ft.	Thickness, In.	Approx. Lb. Per Sq. Ft.	Thickness, In.
3/4	1/80	8	1/8
1	1/64	10	5/32
1 1/2	3/128	12	3/16
2	1/32	14	7/32
2 1/2	5/128	16	1/4
3	3/64	20	1/3
3 1/2	7/128	24	2/5
4	1/16	30	1/2
5	5/64	40	2/3
6	3/32	60	1

Sheets may be produced in widths up to 10 ft. and lengths up to 60 ft. depending upon thickness, but 10 ft. wide and 20 ft. long is usually considered standard. Lead sheets are available as strips or ribbons of various widths such as 12, 18 or 24 in.

Fig. 1 is an electrostatic precipitator for suppressing sulphuric acid mists. It is constructed entirely of sheet lead in a steel framework.

Extruded Lead Products—Lead and most of its alloys may readily be fabricated by the extrusion process. Joints may be made by welding, soldering or mechanically—the choice depending upon the use to which the pipe is put. Sizes may range from fine tubing $\frac{1}{8}$-in. inside diameter and even less, to 12-in. or larger pipe, with almost any desired wall thickness. Either pure lead or alloys may be used. Fig. 2 illustrates how lead pipe is used as coils for cooling hot acid liquors. Note the cage or basket type vessel construction.

Cast Lead Products—Lead and certain of its alloys are excellent for castings providing high strength is not a requisite and they are not for use at temperatures higher than the melting point of the alloy. Casting qualities are excellent, the melting temperatures low, and corrosion resistance

(*Continued on page 276*)

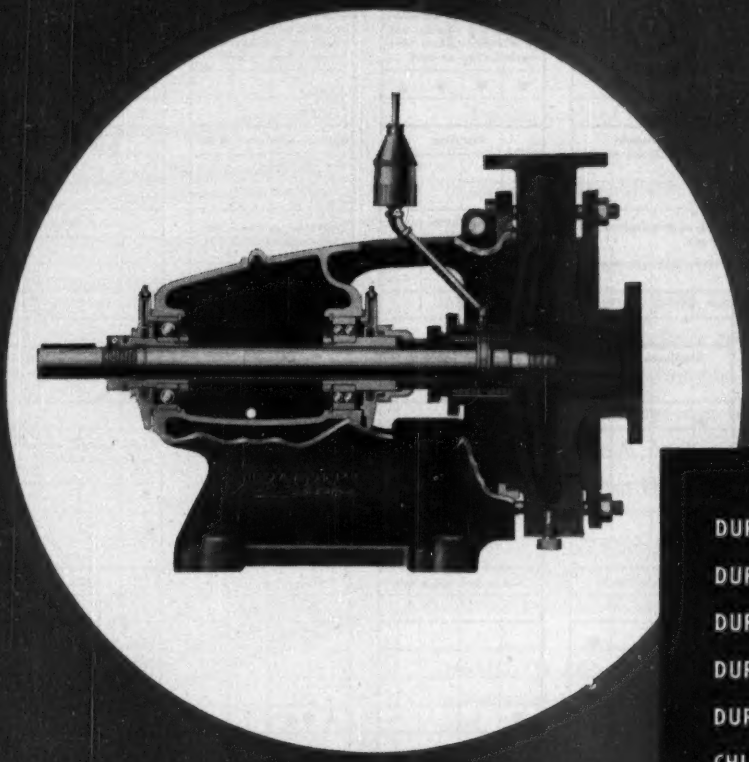
Lead Products Commonly Used in Chemical Construction

Bar lead
Bonded lead lined pipe
Bonded linings (claddings)
Cast lead valves, fittings and flanges
Castings
Die castings
Elliptical lead pipe
Expanded lead lined pipe
Insoluble anodes
Lead covered pipe
Lead lined valves, fittings and flanges
Lead rivets
Lead wire
Lead wool
Pipe
Sheet
Various extrusions
Various prefabrications
- Bubble caps and trays
- Extruded electrodes
- Lead covered copper electrodes
- Gaskets
- Heating and cooling coils
- Heat exchangers
- Laboratory fittings
- Shipping containers
- Sinks and trays

Typical Lead Protected Equipment Used in the CPI

Agitators
Autoclaves
Electrostatic precipitators
Filters
(vacuum or plate and frame)
Fume disposal ducts
Gas conduits
Rayon units
Reactors
Safe pans
Scrubbers
Sonic collectors
Storage vessels
Venturi scrubbers

For *tough* Chemical Service



STANDARD DURCOPUMPS IN THESE ALLOYS

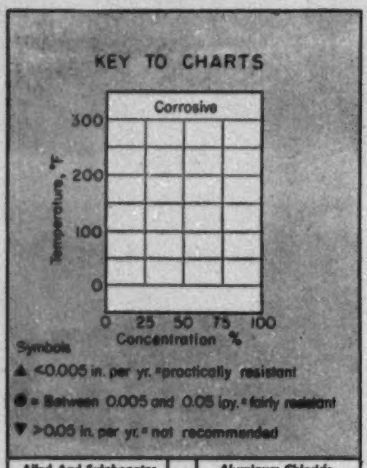
DURIRON	CHLORIMET 3
DURICHLOR	DURCO D-10M
DURIMET 20	MONEL METAL
DURCO 18-8-S	INCONEL
DURCO 18-8-S-Mo	NICKEL
CHLORIMET 2	NI-RESIST #2

Series R Durcopumps, designed and built to handle severe corrosives, are available in the alloys listed above as regular production items. For the details of construction and performance of industry's standard acid pumps, write for free Bulletins P/1 and 100B.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

A product of **THE DURIRON COMPANY, INC., DAYTON, OHIO**

Corrosion Resistance of Lead and Lead Alloys



Acetaldehyde

Practically resistant in manufacture or use.

Acetic Acid

Lead used for storage of cold glacial acid and anhydride in the absence of circulating air. Aeration, temperature, velocity, and air-solution interface have marked effect on lead.

▼ ▼ ▼ ▲

Acetic Anhydride

Lead used for storage of cold glacial acid and anhydride in the absence of circulating air. Aeration, temperature, velocity, and air-solution interface have marked effect on lead.

Acetone

Practically resistant in manufacture or use.

Acetophenone

Used in manufacture and storage.

●

Acetylene

Practically resistant except in moist gas containing hydrogen phosphide.

Aliphatic Alcohols and Fats

Practically resistant in manufacture or use.

Aliphatic Alcohol Sulphonates

Used in manufacture. ●

Alkyl Aryl Sulphonates

Used in manufacture.

Aluminum Chloride

Pipe unusable.

● ▼

Aluminum Fluoride

▼

● —

Aluminum Sulphate

●

Hard lead used in mfg. from bauxite (50% sol'n).

● ●

Ammonia

▲

Liquid (anhydrous) or gas.

Ammonium Chloride

Fairly resistant except in ammoniacal solutions.

● ●

Ammonium Fluoride

▼

● ●

Ammonium Hydroxide

▲ ▲

Ammonium Nitrate

●

Ammonium Phosphate

●

Used in fertilizer mfg.

Ammonium Sulphate

Plus 5% H_2SO_4. ▲

▲ ● ●

Aniline

Used in manufacture of quinone from aniline and 20% H_2SO_4 in solution of benzene. Also used against aniline hydrochloride.

Antimony Chloride

Practically resistant in manufacture or use.

Antimony Trifluoride

▼ ▼

● ●

● ●

Arsenic Acid

●

Barium Chloride

Practically resistant in manufacture or use.

Benzaldehyde

Not recommended.

Benzene

▲

Benzene Sulfonic Acid

● ● ● ●

Benzoic Acid

Not recommended.

▼

Benzyl Chloride

Fairly resistant — used for storage.

Benzyl Phenol

Used in manufacture from phenol, benzyl chloride, and zinc chloride.

Boric Acid

▲ ●

Hard lead preferred.

▲ ●

Bromine

If free from acid used in shipping containers.

●

Butyl Acetate

Practically resistant in manufacture or use.

Butyric Acid

Aeration, temperature, velocity, and air-solution interface have marked effect.

▼ ▼ ▼ ▼

Calcium Bisulphite

Practically resistant — used for fittings.

Calcium Carbonate

Practically resistant at limit of solubility.

Calcium Chloride

Not recommended with fused salt.

●

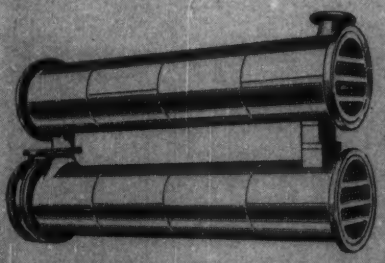
Calcium Hypochlorite

(Continued on page 270)

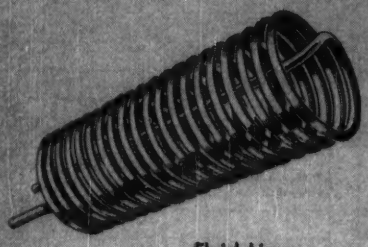
HAYNES Alloy Tubing

Trade-Mark

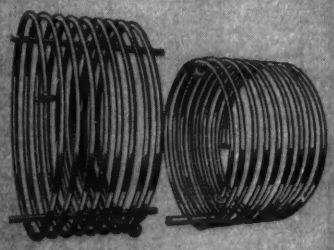
FOR SEVERE SERVICE CONDITIONS



Heat Exchangers



Fluid Lines



Coils

Tubing made of HAYNES alloys gives long, uninterrupted service under severe conditions of heat, corrosion, or oxidation. The tubing can be obtained in four different alloys, each having a particular combination of unusual properties to combat certain service conditions. The chart below shows some of the media these alloys resist. Typical applications are heat exchangers, coils, calandrias, and fluid lines.

All four HAYNES alloys are supplied in welded or welded and cold drawn tubing. Most common welding methods—including metallic-arc and HELIARC welding—can be used in fabricating the tubing installations. If you wish further information about HAYNES alloy tubing, contact the nearest Haynes Stellite Company district office.

USE TUBING OF	FOR RESISTANCE TO
HASTELLOY Alloy B (nickel-molybdenum-iron)	Hydrochloric acid, wet hydrogen chloride gas, sulphuric acid, phosphoric acid, organic acids, high temperatures.
HASTELLOY Alloy C (nickel-molybdenum-chromium-iron)	Nitric acid, free chlorine, acid salts, hydrochloric acid, sulphuric acid, phosphoric acid, organic acids, sulphurous acid, high temperatures.
MULTIMET Alloy (cobalt-chromium-nickel-iron)	Oxidation, high temperatures.
HAYNES Alloy No. 25 (cobalt-chromium-tungsten-nickel)	Oxidation, high temperatures, carburization, wet chlorine, nitric acid.

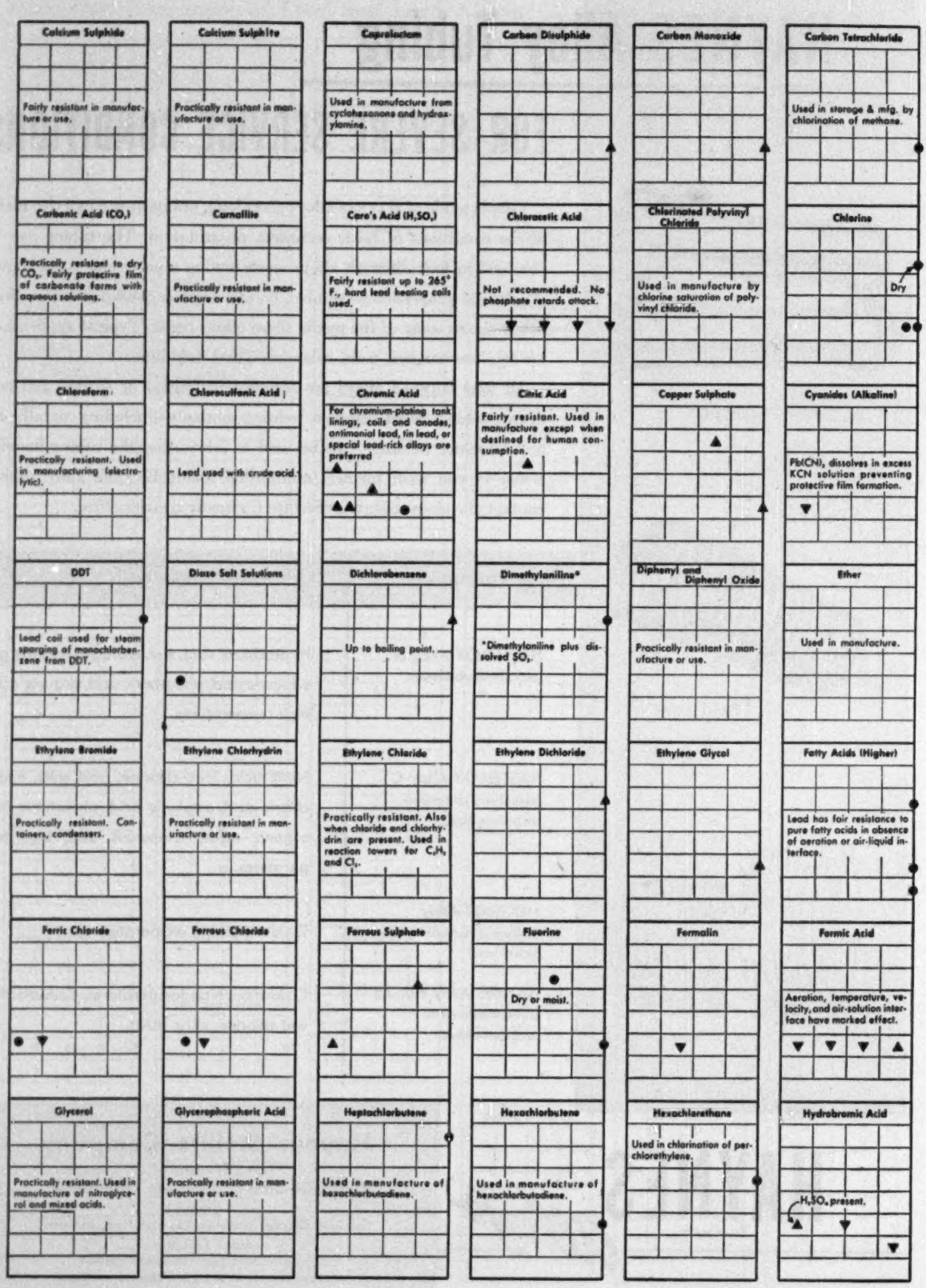
HAYNES *alloys*

TRADE-MARK

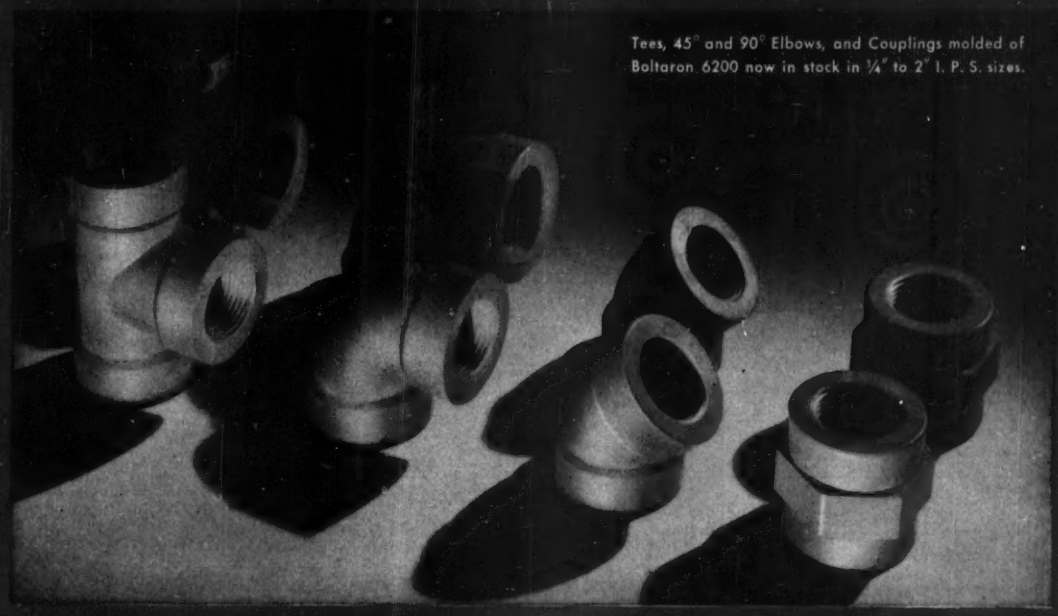
Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes," "Hastelloy," "Heliarc," and "Multimet" are trade-marks of Union Carbide and Carbon Corporation.

Corrosion Resistance of Lead and Lead Alloys, *cont* . . .


Calcium Sulphide
Fairly resistant in manufacture or use.
Calcium Sulphite
Practically resistant in manufacture or use.
Caprolactam
Used in manufacture from cyclohexanone and hydroxylamine.
Carbon Disulphide
Carbon Monoxide
Carbon Tetrachloride
Used in storage & mfg. by chlorination of methane.
Carbonic Acid (CO_2)
Practically resistant to dry CO_2. Fairly protective film of carbonate forms with aqueous solutions.
Carnallite
Practically resistant in manufacture or use.
Caro's Acid (H_2SO_5)
Fairly resistant up to 265° F., hard lead heating coils used.
Chloracetic Acid
Not recommended. Na phosphate retards attack.
Chlorinated Polyvinyl Chloride
Used in manufacture by chlorine saturation of polyvinyl chloride.
Chlorine
Dry
Chloroform
Practically resistant. Used in manufacturing (electrolytic).
Chlorosulfonic Acid
Lead used with crude acid.
Chromic Acid
For chromium-plating tank linings, coils and anodes, antimonial lead, tin lead, or special lead-rich alloys are preferred
Citric Acid
Fairly resistant. Used in manufacture except when destined for human consumption.
Copper Sulphate
Cyanides (Alkaline)
$Pb(CN)_2$ dissolves in excess KCN solution preventing protective film formation.
DDT
Lead coil used for steam sparging of monochlorbenzene from DDT.
Diazo Salt Solutions
Dichlorobenzene
Up to boiling point.
Dimethylaniline*
*Dimethylaniline plus dissolved SO_2.
Diphenyl and Diphenyl Oxide
Practically resistant in manufacture or use.
Ether
Used in manufacture.
Ethylene Bromide
Practically resistant. Containers, condensers.
Ethylene Chlorhydrin
Practically resistant in manufacture or use.
Ethylene Chloride
Practically resistant. Also when chloride and chlorhydrin are present. Used in reaction towers for C_2H_4 and Cl_2.
Ethylene Dichloride
Ethylene Glycol
Fatty Acids (Higher)
Lead has fair resistance to pure fatty acids in absence of aeration or air-liquid interface.
Ferric Chloride
Ferrous Chloride
Ferrous Sulphate
Fluorine
Dry or moist.
Formalin
Formic Acid
Aeration, temperature, velocity, and air-solution interface have marked effect.
Glycerol
Practically resistant. Used in manufacture of nitroglycerol and mixed acids.
Glycerophosphoric Acid
Practically resistant in manufacture or use.
Heptachlorbutene
Used in manufacture of hexachlorbutadiene.
Hexachlorbutene
Used in manufacture of hexachlorbutadiene.
Hexachlorethane
Used in chlorination of perchlorethylene.
Hydrobromic Acid
H_2SO_4 present.

(Continued on page 272)



Tees, 45° and 90° Elbows, and Couplings molded of Boltaron 6200 now in stock in ¼" to 2" I. P. S. sizes.

Now Available — Molded Pipe Fittings in RIGID NON-PLASTICIZED *Boltaron* 6200 POLYVINYL-CHLORIDE

Standard, threaded, I. P. S. fittings in ¼" to 2" sizes are now carried in stock for use with Boltaron pipe for best possible results in overcoming corrosion problems. Pipe is available in sizes to match in 10′ and 20′ lengths. Pipe can be threaded using ordinary pipe dies.

ALSO AVAILABLE: *Sheet Stock* in sizes approximately 30" x 60"—1/32" to 1" thick; *Bar Stock* in 10′ lengths, ¼" to 1" in diameter.

PROPERTIES OF BOLTARON 6200 — (Write for specific results of ASTM tests.)

CHEMICAL PROPERTIES — Outstanding chemical resistance to organic and inorganic acids, alkalies, alcohol and foodstuffs. Laboratory tests are continuously carried on. Information on many chemicals available on request.

THERMAL PROPERTIES—Good low temperature factor, high heat distortion temperature, low coefficient of expansion, non-flammable.

MECHANICAL PROPERTIES — Great strength, light weight, high impact strength, non-toxic, ability to be drawn, formed, molded, machined and welded by hot gas technique, good deformation and abrasion resistance.

AVAILABILITY — Distribution is limited to selected fabricators trained by the Hartwell Company. This ensures that your fabricator will make efficient and economical use of Boltaron 6200 and that the results you expect from this material will be achieved. Trained fabricators are now established nationally. Direct your inquiries to the H. N. Hartwell Company.

PARTIAL LIST OF USES

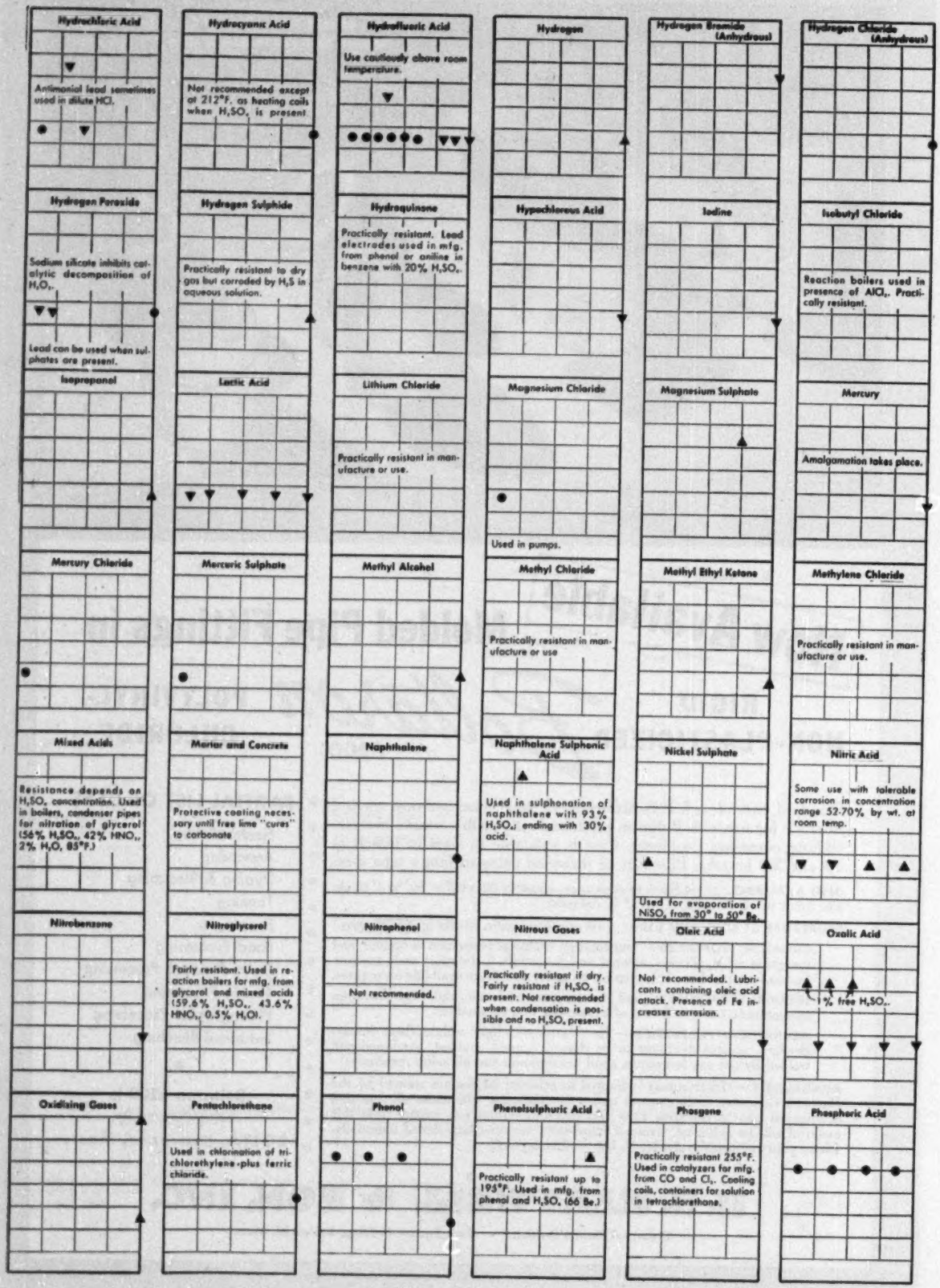
- Electroplating
- Anodizing
- Dyeing & Bleaching
- Tanning
- Brewing
- Food Processing
- Dairy Products Processing
- Textile Processing
- Photographic Processing
- Industrial Plumbing

Boltaron 6200 is *manufactured by* **BOLTA, Lawrence, Mass.**

H. N. HARTWELL & SON, INC.

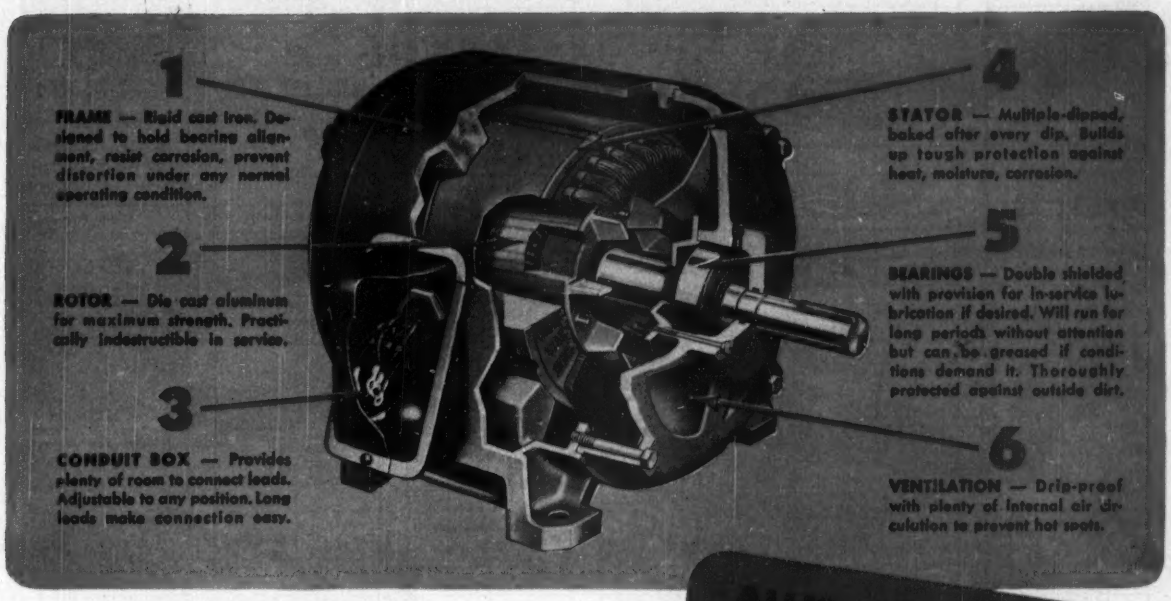
Industrial Plastics Division • Park Square Building, Boston 16, Mass.

Corrosion Resistance of Lead and Lead Alloys, *cont* . . .


Hydrochloric Acid
Antimonial lead sometimes used in dilute HCl.
Hydrogen Peroxide
Sodium silicate inhibits catalytic decomposition of H_2O_2.
Lead can be used when sulphates are present.
Isopropanol
Mercury Chloride
Mixed Acids
Resistance depends on H_2SO_4 concentration. Used in boilers, condenser pipes for nitration of glycerol (56% H_2SO_4, 42% HNO_3, 2% H_2O, 85°F.)
Nitrobenzene
Oxidizing Gases
Hydrocyanic Acid
Not recommended except at 212°F. as heating coils when H_2SO_4 is present
Hydrogen Sulphide
Practically resistant to dry gas but corroded by H_2S in aqueous solution.
Lactic Acid
Mercuric Sulphate
Mortar and Concrete
Protective coating necessary until free lime "cures" to carbonate
Nitroglycerol
Fairly resistant. Used in reaction boilers for mfg. from glycerol and mixed acids (59.6% H_2SO_4, 43.6% HNO_3, 0.5% H_2O).
Pentachlorethane
Used in chlorination of trichlorethylene plus ferric chloride.
Hydrofluoric Acid
Use cautiously above room temperature.
Hydroquinone
Practically resistant. Lead electrodes used in mfg. from phenol or aniline in benzene with 20% H_2SO_4.
Lithium Chloride
Practically resistant in manufacture or use.
Methyl Alcohol
Naphthalene
Nitrophenol
Not recommended.
Phenol
Hydrogen
Hypochlorous Acid
Magnesium Chloride
Used in pumps.
Methyl Chloride
Practically resistant in manufacture or use
Naphthalene Sulphonic Acid
Used in sulphonation of naphthalene with 93% H_2SO_4; ending with 30% acid.
Nitrous Gases
Practically resistant if dry. Fairly resistant if H_2SO_4 is present. Not recommended when condensation is possible and no H_2SO_4 present.
Phenolsulphuric Acid
Practically resistant up to 195°F. Used in mfg. from phenol and H_2SO_4 (66 Be.)
Hydrogen Bromide (Anhydrous)
Iodine
Magnesium Sulphate
Methyl Ethyl Ketone
Nickel Sulphate
Used for evaporation of $NiSO_4$ from 30° to 50° Be.
Oleic Acid
Not recommended. Lubricants containing oleic acid attack. Presence of Fe increases corrosion.
Phosgene
Practically resistant 255°F. Used in catalyzers for mfg. from CO and Cl_2. Cooling coils, containers for solution in tetrachlorethane.
Hydrogen Chloride (Anhydrous)
Isobutyl Chloride
Reaction boilers used in presence of $AlCl_3$. Practically resistant.
Mercury
Amalgamation takes place.
Methylene Chloride
Practically resistant in manufacture or use.
Nitric Acid
Some use with tolerable corrosion in concentration range 52-70% by wt. at room temp.
Oxalic Acid
1% free H_2SO_4.
Phosphoric Acid

(Continued on page 274)

Look for These 6 Signs of Good Motor Design


1
FRAME — Rigid cast iron. Designed to hold bearing alignment, resist corrosion, prevent distortion under any normal operating condition.
2
ROTOR — Die cast aluminum for maximum strength. Practically indestructible in service.
3
CONDUIT BOX — Provides plenty of room to connect leads. Adjustable to any position. Long leads make connection easy.
4
STATOR — Multiple-dipped, baked after every dip. Builds up tough protection against heat, moisture, corrosion.
5
BEARINGS — Double shielded with provision for in-service lubrication if desired. Will run for long periods without attention but can be greased if conditions demand it. Thoroughly protected against outside dirt.
6
VENTILATION — Drip-proof with plenty of internal air circulation to prevent hot spots.

Get Allis-Chalmers Motors for these Extra Values!

ALLIS-CHALMERS **MOTORS**

Certified Service — Nearly 100 Allis-Chalmers Certified Service Shops provide factory-approved parts and service on your Allis-Chalmers motors. Screened for modern equipment, adequate experience and business integrity, these independently owned service shops will provide you with prompt, economical repair and maintenance.

Complete Drives from One Source — Allis-Chalmers can supply your complete drive — motor, control and *Texrope* V-belt drive — from one convenient, reliable source.

Application Engineering — Your Allis-Chalmers District Office representative or Authorized Dealer will be glad to help you select exactly the right motors for your needs. For additional information, write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6052. A-3954

Texrope is an Allis-Chalmers trademark.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

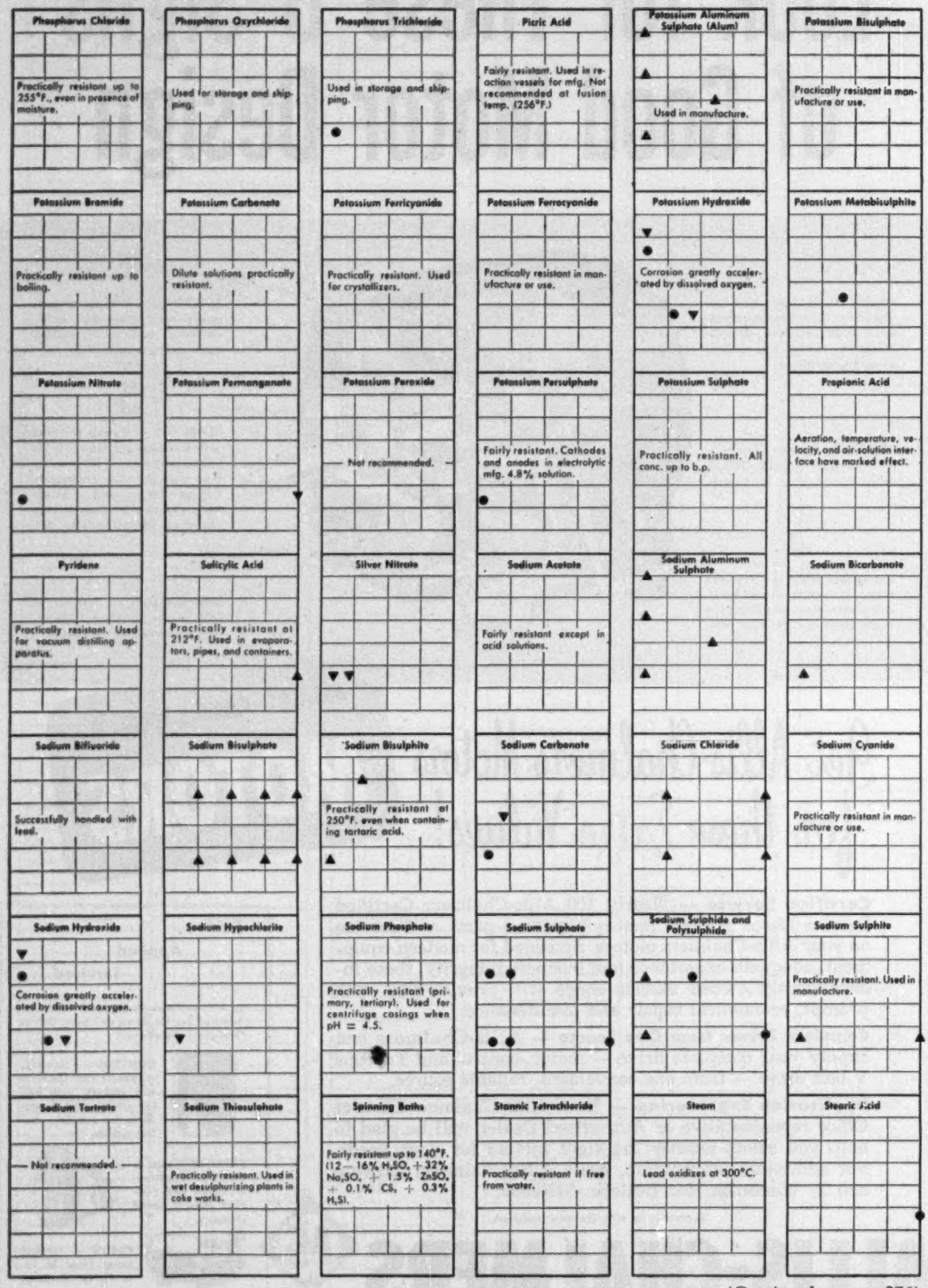
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

Corrosion Resistance of Lead and Lead Alloys, *cont* . . .


Phosphorus Chloride
Practically resistant up to 255°F., even in presence of moisture.
Phosphorus Oxychloride
Used for storage and shipping.
Phosphorus Trichloride
Used in storage and shipping.
Picric Acid
Fairly resistant. Used in reaction vessels for mfg. Not recommended at fusion temp. (256°F.)
Potassium Aluminum Sulphate (Alum)
Used in manufacture.
Potassium Bisulphate
Practically resistant in manufacture or use.
Potassium Bromide
Practically resistant up to boiling.
Potassium Carbonate
Dilute solutions practically resistant.
Potassium Ferricyanide
Practically resistant. Used for crystallizers.
Potassium Ferrocyanide
Practically resistant in manufacture or use.
Potassium Hydroxide
Corrosion greatly accelerated by dissolved oxygen.
Potassium Metabisulphite
Potassium Nitrate
Potassium Permanganate
Potassium Peroxide
Not recommended.
Potassium Persulphate
Fairly resistant. Cathodes and anodes in electrolytic mfg. 4.8% solution.
Potassium Sulphate
Practically resistant. All conc. up to b.p.
Propionic Acid
Aeration, temperature, velocity, and air-solution interface have marked effect.
Pyridene
Practically resistant. Used for vacuum distilling apparatus.
Salicylic Acid
Practically resistant at 212°F. Used in evaporators, pipes, and containers.
Silver Nitrate
Sodium Acetate
Fairly resistant except in acid solutions.
Sodium Aluminum Sulphate
Sodium Bicarbonate
Sodium Bifluoride
Successfully handled with lead.
Sodium Bisulphate
Sodium Bisulphite
Practically resistant at 250°F. even when containing tartaric acid.
Sodium Carbonate
Sodium Chloride
Sodium Cyanide
Practically resistant in manufacture or use.
Sodium Hydroxide
Corrosion greatly accelerated by dissolved oxygen.
Sodium Hypochlorite
Sodium Phosphate
Practically resistant (primary, tertiary). Used for centrifuge casings when pH = 4.5.
Sodium Sulphate
Sodium Sulphide and Polysulphide
Sodium Sulphite
Practically resistant. Used in manufacture.
Sodium Tartrate
Not recommended.
Sodium Thiosulphate
Practically resistant. Used in wet desulphurizing plants in coke works.
Spinning Baths
Fairly resistant up to 140°F. (12—16% H_2SO_4 + 32% Na_2SO_4 + 1.5% $ZnSO_4$ + 0.1% CS, + 0.3% H_2S).
Stannic Tetrachloride
Practically resistant if free from water.
Steam
Lead oxidizes at 300°C.
Stearic Acid

(Continued on page 276)

No. 1-B electric vibrating Feeder—for small-capacity operations up to 3500 pounds per hour. Ideal for laboratory use.

VIBRATING EQUIPMENT

FEEDERS COOLERS
DRYERS CONVEYORS
PACKERS SCREENS

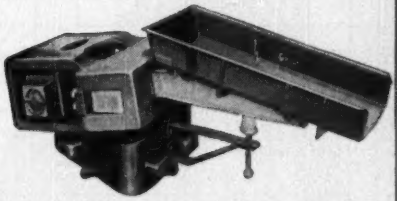
A type and size to meet requirements in continuous processing—at low over-all cost.

Absolute control over flow of wide variety of materials.

ULTIMATE IN FLEXIBILITY!

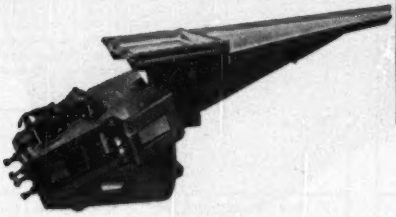
Literature Available

Jeffrey-Traylor No. 4-L Water-cooled Feeder with 10" outside diameter x 4' long water-jacketed deck. For feeding to high temperature furnaces or for handling extremely hot materials.



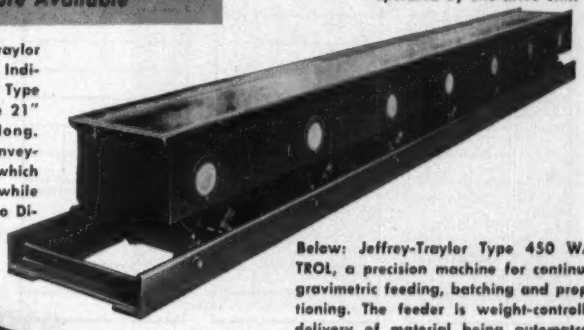
Jeffrey-Traylor No. 3 electric vibrating spark-proof Feeder with 12" x 30" open-pan deck. For feeding operations in hazardous atmospheres or under extreme moisture conditions.

M-V Mechanical Vibrating Conveyor for conveying abrasive, lumpy or rough materials, hot or cold, dry or wet, as well as fine materials. Up to 80' can be operated by one drive unit.

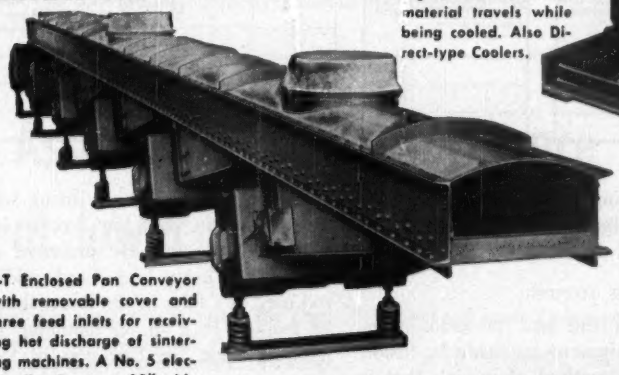


Jeffrey-Traylor electric vibrating Spreader Feeder, 14" wide x 70" long with one edge tapered to spread to 55" width.

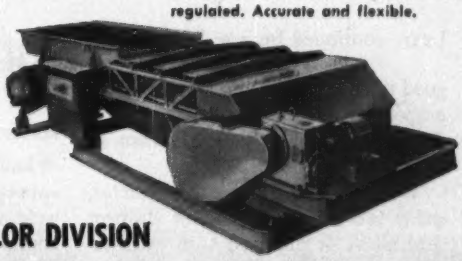
Right: Jeffrey-Traylor electric vibrating Indirect-type Cooler. Type HI-21F open type 21" wide and 18' long. Has solid plate conveying surface over which material travels while being cooled. Also Direct-type Coolers.



Below: Jeffrey-Traylor Type 450 WAY-TROL, a precision machine for continuous gravimetric feeding, batching and proportioning. The feeder is weight-controlled, delivery of material being automatically regulated. Accurate and flexible.



J-T Enclosed Pan Conveyor with removable cover and three feed inlets for receiving hot discharge of sintering machines. A No. 5 electric vibrating type, 25" wide x 45' long.



JEFFREY-TRAYLOR DIVISION

CAPACITIES—FROM A FEW OUNCES TO TWO THOUSAND TONS PER HOUR

THE JEFFREY MANUFACTURING COMPANY

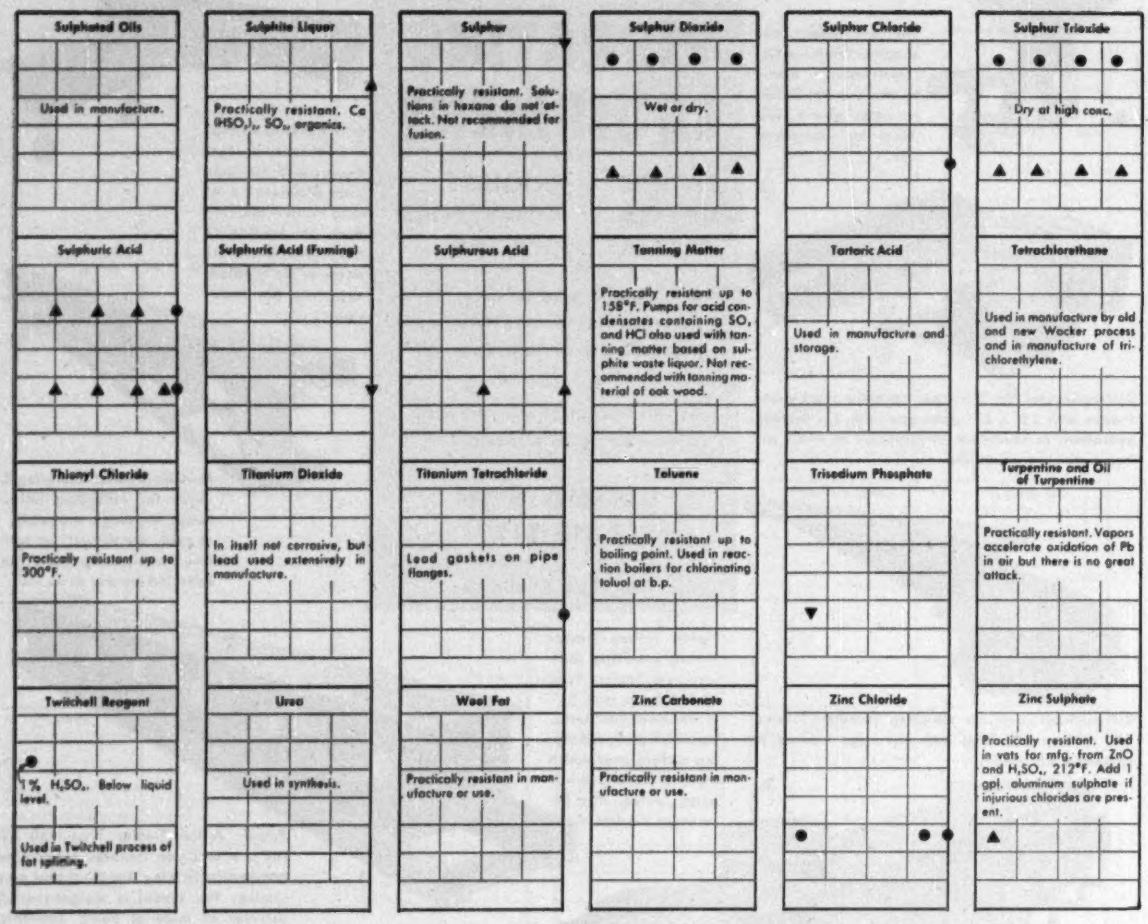
909 North Fourth St., Columbus 16, Ohio

1877 75 1952

Baltimore 2 Boston 16 Cincinnati 2 Detroit 13 Houston 2 New York 7 St. Louis 1
Beckley, W. Va. Buffalo 2 Cleveland 13 Ferry Port, Pa. Jacksonville 2 Philadelphia 2 Salt Lake City 1
Birmingham 3 Chicago 1 Denver 2 Boston, Ky. Milwaukee 2 Pittsburgh 22

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Tiffin Scale Co., Tiffin, Ohio
Jacobs Mfg. Co., Columbus, Ohio

Corrosion Resistance of Lead and Lead Alloys, *cont* . . .


Sulphated Oils
Used in manufacture.
Sulphite Liquor
Practically resistant. Ca(HSO3)2, SO2, organics.
Sulphur
Practically resistant. Solutions in hexane do not attack. Not recommended for fusion.
Sulphur Dioxide
Wet or dry.
Sulphur Chloride
Sulphur Trioxide
Dry at high conc.
Sulphuric Acid
Sulphuric Acid (Fuming)
Sulphurous Acid
Tanning Matter
Practically resistant up to 158°F. Pumps for acid condensates containing SO2 and HCl also used with tanning matter based on sulphite waste liquor. Not recommended with tanning material of oak wood.
Tartaric Acid
Used in manufacture and storage.
Tetrachlorethane
Used in manufacture by old and new Wacker process and in manufacture of trichlorethylene.
Thionyl Chloride
Practically resistant up to 300°F.
Titanium Dioxide
In itself not corrosive, but lead used extensively in manufacture.
Titanium Tetrachloride
Lead gaskets on pipe flanges.
Toluene
Practically resistant up to boiling point. Used in reaction boilers for chlorinating toluol at b.p.
Trisodium Phosphate
Turpentine and Oil of Turpentine
Practically resistant. Vapors accelerate oxidation of Pb in air but there is no great attack.
Twitchell Reagent
1% H2SO4. Below liquid level.
Used in Twitchell process of fat splitting.
Urea
Used in synthesis.
Wool Fat
Practically resistant in manufacture or use.
Zinc Carbonate
Practically resistant in manufacture or use.
Zinc Chloride
Zinc Sulphate
Practically resistant. Used in vats for mfg. from ZnO and H2SO4, 212°F. Add 1 gpl. aluminum sulphate if injurious chlorides are present.

LEAD, *continued from p. 266*

good under most conditions. A 17-ton evaporator made entirely of cast 8 percent antimonial lead is shown in Fig. 3.

Where strength is a critical factor, many articles can be cast of stronger lead alloys or provided with extra reinforcement through proper design. Sometimes reinforcing elements made of stronger metals are cast into the lead to give greater strength.

Lead Clad Products—To better cope with the demands of today's chemical plant operations, lead's corrosion resitance is combined with the strength of steel or the high heat transfer of copper through clad or bonded lead. Vessels designed for operation at high temperatures, fluctuating temperature or vacuum are usually constructed of steel with a lining of lead clad or bonded directly to the steel, as shown in Fig. 4. Heating coils of copper with an external lead cladding are in common use as are steel pipes and valves with an internal lead cladding.

METHOD OF JOINING

Joints in lead used for corrosion resistant equipment are made by fusion welding, a method of joining that is commonly known by the somewhat misleading term of lead "burning"—misleading because the lead is not burned but only melted. This method ins:res that no metal less resistant than lead will be exposed to corrosive attack.

If metal has to be added through the use of a filler or welding rod in making joints, the rod should have the same composition as the lead being joined so that all exposed metal may resist attack uniformly. Oxygen and hydrogen are the most generally preferred gases for lead welding. Others, such as oxygen and acetylene, and oxygen and city gas, are also used.

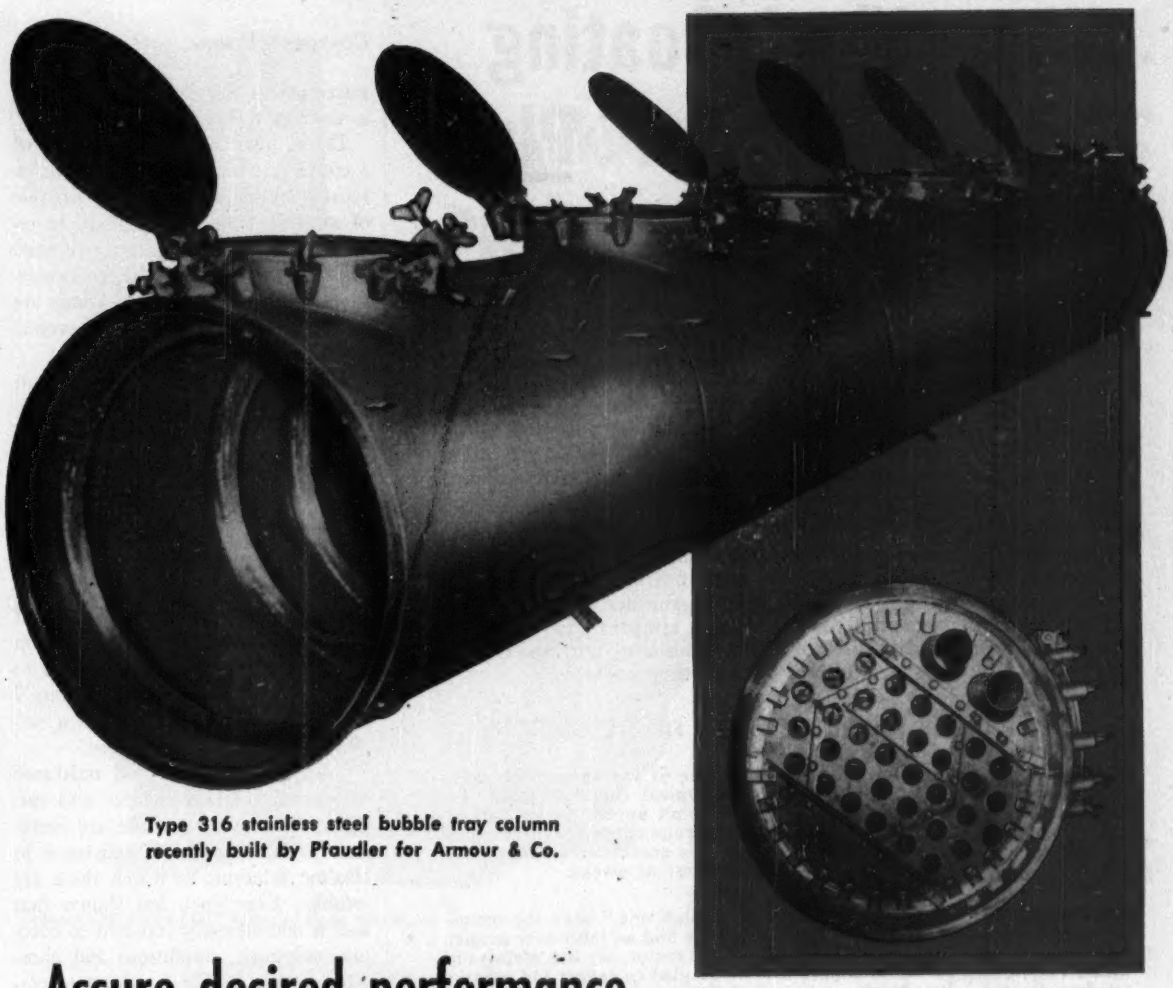
For welding, lead is prepared much the same as for soldering, being scrupulously clean, but no flux is employed. Lap joints are preferred except on very heavy lead. Lead welding rod used as a filler in the joints should be from $\frac{1}{8}$ to $\frac{3}{8}$ in. in diameter, depending upon the thickness of lead.

CORROSION CHARACTERISTICS

Lead relies for its high resistance to corrosion upon a thin protective coating that forms on its surface.

When the coating is one of the highly insoluble lead salts such as the sulphate, carbonate or phosphate, resistance to corrosion is high and the environment generally promotes self-healing upon mechanical injury.

On the other hand, if a soluble film forms such as the nitrate, acetate or chloride, little protection is afforded, and the lead may corrode further. Likewise, if insoluble protective coatings are removed mechanically (as by abrasion or erosion) or dissolved chemically (as in the case of some



Type 316 stainless steel bubble tray column recently built by Pfaudler for Armour & Co.

Assure desired performance at lower cost with Pfaudler Alloy Towers

Whatever your requirements for fractionating or stripping columns, for bleaching or absorption towers; Pfaudler is prepared to meet them at the *lowest possible cost* to you.

CUSTOM DESIGN

If you have your own design group, we can meet your most exacting specifications. Or, we will be glad to undertake the complete process engineering—or any phase of it including bubble tray layout—as well as equipment design to meet your *desired end product requirements.*

WIDE RANGE OF ALLOYS

To assure maximum service life for your equipment, Pfaudler offers a *complete* range of corrosion resistant materials. It includes stainless steel, hastelloy, monel, nickel, inconel, aluminum, carbon steel and clad materials. And to meet special corrosion problems at low cost, Pfaudler is prepared to heat treat stainless steel equipment in automatically controlled furnaces.

PROCESS KNOW-HOW

From years of specialized contact with such basic industries as chemicals, pharmaceuticals, petrochemicals, food, dairy, beverage, and others, Pfaudler engineers are able to keep pace with improvements in *all* the process industries... and translate this broad experience into economical, soundly-engineered recommendations for *your* process equipment.

Write today for full details on the complete Pfaudler line of chemical processing equipment.

Pfaudler

THE PFAUDLER CO.
ROCHESTER 3, N. Y.
Engineers and fabricators of corrosion resistant process equipment

GLASS-LINED STEEL • HASTELLOY • ALUMINUM • CARBON STEEL • SOLID OR CLAD STAINLESS STEEL • NICKEL • INCONEL • MONEL

Want Vinyl Coating PROTECTION? . . . Plus SIMPLE APPLICATION?

Revolutionary Prufcoat Primer P-50 Makes it Possible to Use Vinyl Coatings Just Like Ordinary Paints

No longer need chemical resistant vinyl coatings be considered in a "specialty" category. Thanks to new Prufcoat Primer P-50, vinyls are now as easy to apply as ordinary paints. After only routine wirebrushing, simply prime with ready-mixed P-50 just as you would with red lead. Vinyl top coats then can be applied after only overnight drying.

On old or new metal, this quick, easy "Prime and Paint" procedure eliminates all danger of underfilm corrosion failures as well as providing positive primer-to-surface and vinyl-to-primer adhesion. It's the revolutionary, simpler vinyl system that licks the most difficult corrosion problems, while slashing hours off labor time . . . dollars off painting costs.

PROVED UNDER TOUGHEST POSSIBLE FIELD CONDITIONS

PROBLEM: Fumes generated in the manufacture of sodium hypochlorite were attacking every steel surface in this typical chemical plant. To make matters even more disastrous, there didn't appear to be a paint system available that could control the cancerous condition. Underfilm corrosion developed quickly, rust creepage was continual, and the most meticulously applied coatings failed in a matter of weeks.

SOLUTION: "We knew our problem was a tough one," says the manufacturer's maintenance chief. "Where could we find an inhibitive primer that would both stop the existing active corrosion on the metal *and* which vinyl coatings would adhere to? We're glad to report (14 months after application) that Prufcoat Primer P-50 with "A" Series Prufcoat topcoats has filled the bill . . . without any sandblasting or other fancy preparation work, too!"

What worked for this leading chemical manufacturer will work for *you* . . . in *your* plant . . . under *your* corrosive conditions. Write today for Technical Bulletin No. 015. Or better still, order a trial quantity of Primer P-50 along with some "A" Series Prufcoat vinyl coatings and *see for yourself!*

MAINTENANCE ENGINEERS!
Check These Primer P-50 Features

- ✓ The first completely practical primer for vinyl coatings.
- ✓ Only routine surface preparation is needed.
- ✓ Applies like ordinary paint and dries fast.
- ✓ Positive adhesion to old or new metal is assured.
- ✓ Under-film corrosion and rust creepage are controlled.

PRUFCOAT LABORATORIES, INC.
50 East 42nd Street, New York 17, N. Y.

To Save Time, Trouble and Money
Just "PRIME and PAINT" with PRUFCOAT

mixed corrosives), corrosion resistance is similarly reduced.

Dilute nitric acid is an example of a corrosive which reacts with lead to form a soluble salt. It is also capable of reacting with lead sulphate to reduce its function as a protective coating depending upon the concentration. Obviously where lead linings are protected by a brick lining, the protective film will not be disturbed.

In the case of corrosives which, in themselves, do not readily form a protective film and will not dissolve lead sulphate, it is often possible to make the lining corrosion proof by swabbing the lead with dilute sulphuric acid or filling the vessel with dilute sulphuric acid for a short period of time to establish a protective sulphate film.

At 70 deg. F. in 25 to 35 percent sulphuric acid, chemical lead will form a complete sulphate film in from 9 to 10 hr. Under the same conditions 9 percent antimonial lead forms a sulphate film in from 1 to 1½ hr.

Lead generally has good resistance to neutral solutions where lead carbonate and possibly oxide are corrosion products, and fair resistance to alkaline solutions in which these are soluble. Experience has shown that lead is commercially resistant to chromic, sulphuric, sulphurous and phosphoric acids; that it is subject to corrosion at somewhat higher rates by hydrochloric and hydrofluoric acids; and that it is susceptible to being strongly corroded by acetic, formic and nitric. Nitrate solutions are moderately corrosive, carbonates are not.

PERFORMANCE WITH CORROSIVES

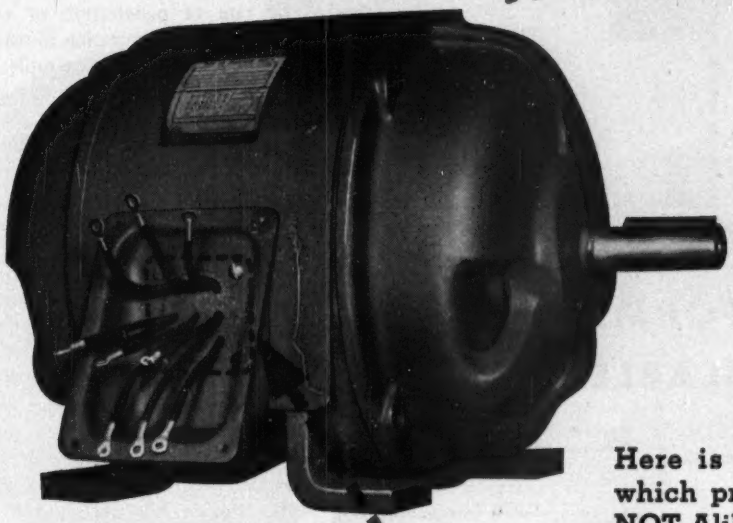
Among the many variables determining the suitability of lead or any other material may be temperature,

Processes With Which Lead or Lead Protected Equipment May Be Used

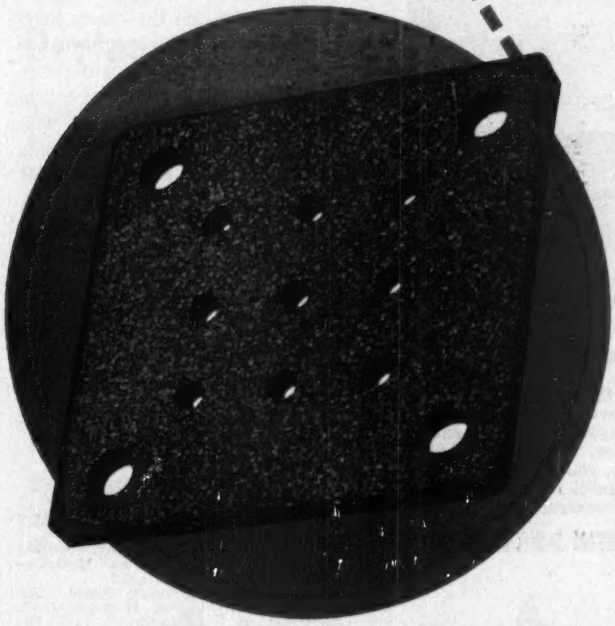
Acid recovery (regeneration process)
Acid recovery (vacuum process)
Air pollution control
Ammonia saturation
Bleaching
Chamber process acid manufacture
Chromium plating
Copper plating
Dye intermediate reactors
Electrogalvanizing
Electrowinning of zinc, manganese and copper
Esterification
Halogenation
Hydrolysis
Nickel plating
Pickling
Reduction
Stream pollution control
Sulphation
Sulphonation
Sulphuric acid dilution
Waste recovery

RELIANCE
Precision-Built
MOTORS

In making a better motor . . .
IT'S THE LITTLE THINGS
THAT COUNT, too!



Reliance PRECISION-BUILT Protected Open A-c. Motor



Here is one of the many extras which prove that "All Motors are NOT Alike."

This synthetic-rubber gasket . . .

★ *Permanently indexes the motor leads*

★ *Prevents leads from rubbing against metal parts*

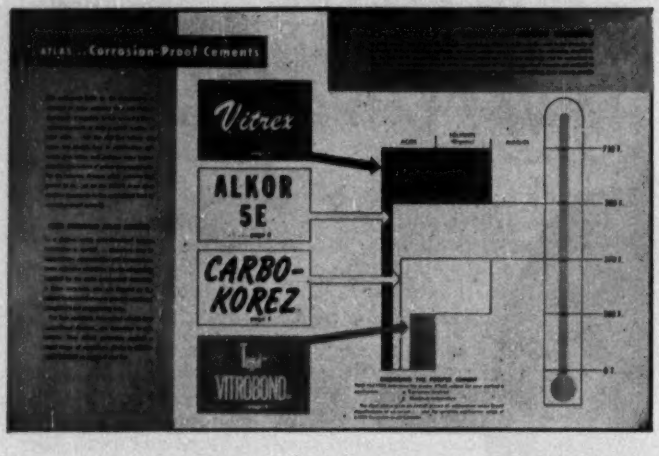
★ *Prevents water from entering motor at conduit box*

Write for more evidence of the many ways in which Reliance Precision-Built Motors are made better to deliver dependable power longer. Bulletin B-2101 provides selection data for a-c. motors from 3/4 to 300 horsepower.

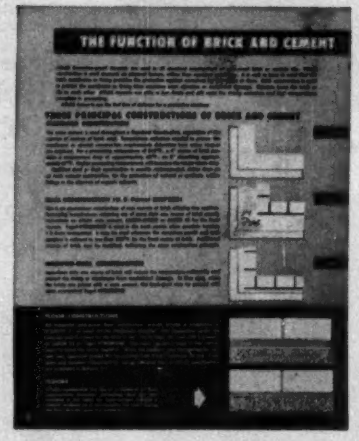
RELIANCE ELECTRIC AND ENGINEERING CO.

1062 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities

. . . a practical guide to Corrosion-proof cements



NEW, INFORMATIVE BULLETIN AVAILABLE WITHOUT OBLIGATION



HERE in concise form you will find complete data on the basic types of corrosion-proof cements and constructions. Each cement is graphically shown in its relationship to temperature and the broad classes of corrosives handled.

In addition, RESISTANCE TABLES are included which cover 176 common corrosives, and relate them to cements satisfactory for that service. And, ESTIMATING TABLES guide you in figuring not only cement, but also brick requirements for most corrosion-proof construction jobs.

SEND FOR YOUR COPY OF BULLETIN 5-2 TODAY

ATLAS MINERAL

ATLAS PRODUCTS STAND ... between your process and corrosion.

101 CHESTNUT STREET
MERTZTOWN, PENNSYLVANIA
Plant also at Houston, Texas

Corrosion-proof: Cements . . . Coatings . . . Linings

concentration, grade of lead or type of alloy, rate of flow, presence of oxygen, degree of abrasion-erosion and presence of impurities. A careful evaluation of these factors is a prime requisite before selecting or rejecting any material.

When comparisons are being made between corrosive resistant materials, the corrosion rate data should be carefully interpreted because use of either the rate of penetration or rate of weight loss as a corrosion measure can be misleading. For example, at a given rate of penetration the greater thickness of a lead lining obviously means a longer service life than could be expected from a thinner material of construction. Similarly, when corrosion is based on weight loss the high density of lead should be kept in mind. What might appear as excessive corrosion expressed in lead weight loss would be a nominal rate in terms of volume loss or penetration.

Actually with most corrosives a specific corrosion rate for lead is often a hypothetical figure since the protective film which forms on contact usually results in a high initial rate of corrosion but once the film has developed, the corrosion rate slows down to a practically negligible figure.

The data given on the charts herewith is indicative of the performance of lead in contact with various corrosive chemicals. Since operating conditions vary widely, it is usually wise to use actual exposure tests made under operating conditions to forecast performance in a specific application. However, corrosion rates based on actual plant tests conducted under operating conditions do not necessarily represent the highest concentrations or temperatures under which lead would serve satisfactorily. It is reasonable to expect the corrosion rate to decrease at lower temperatures and, in most cases, lower concentrations.

REFERENCES

Uhlig, H. H., "Corrosion Handbook," John Wiley & Sons, New York, 1948.

Lee, J. A., "Materials of Construction for Chemical Process Industries," McGraw-Hill Book Co., New York, 1950.

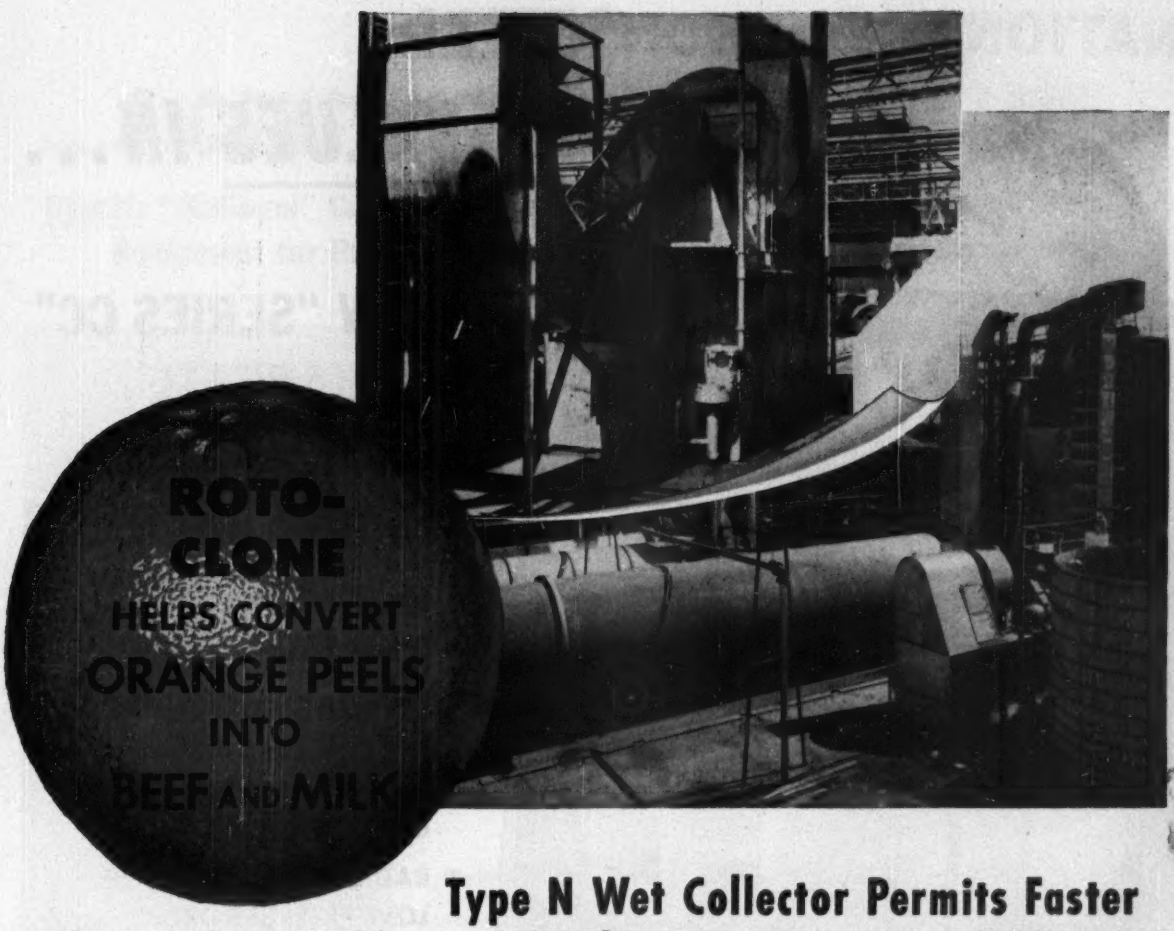
Rabald, Erich, "Corrosion Guide," Elsevier Publishing Co., Inc., Houston, 1951.

"Materials of Construction," 14th Biennial Report, *Chemical Engineering*, Nov. 1950.

Roll, Kempton H., "Lead in Modern Chemical Construction," *Chemical Engineering*, Jan. 1952.

Roll, Kempton H., "Physical and Corrosion Characteristics of Lead in the Chemical Industry," *Corrosion*, Aug. 1949.

Nelson, G. H., "Corrosion Data Survey," Shell Development Co., Emeryville, Calif.



Type N Wet Collector Permits Faster Drying of Peels for Feed, Without Creating Dust Nuisance

Increased sales of frozen citrus concentrate result in mountains of waste peel. But they're not wasted. Instead, the peels are put through rotary dryers for conversion into high-nutrition feed for beef and dairy cattle.

To step-up this feed production, the Exchange Orange Products Co., Ontario, Calif., has installed the new direct-fired rotary dryer pictured above. It is designed to reduce the moisture content of the pulp and peel from 74 to 7%, without damaging the material. Operating on a 24-hour schedule, the dryer is exceeding its rated 48-ton daily capacity.

By-product of this operation is dust-laden air, ranging from 140 to 240°F, which is discharged at the rate of 24000 cfm. Obviously, a cleaning job for a wet collector—a Type N ROTO-CLONE*, such as pictured in inset. Reasons for its selection—high cleaning efficiency; ability to withstand moisture and high temperatures; compact, space-saving design; choice of sludge disposal method to fit plant operation.

ROTO-CLONE Wet Collectors have "won their spurs" for efficient, economical dust control of dryers in the chemical, rock products, metal and non-metalic mining and coal industries. Let us show you how dust from dryers can be eliminated as an irritant to workers and community. Contact your local AAF representative now or write us direct for complete data on ROTO-CLONE Wet Collectors.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Office) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

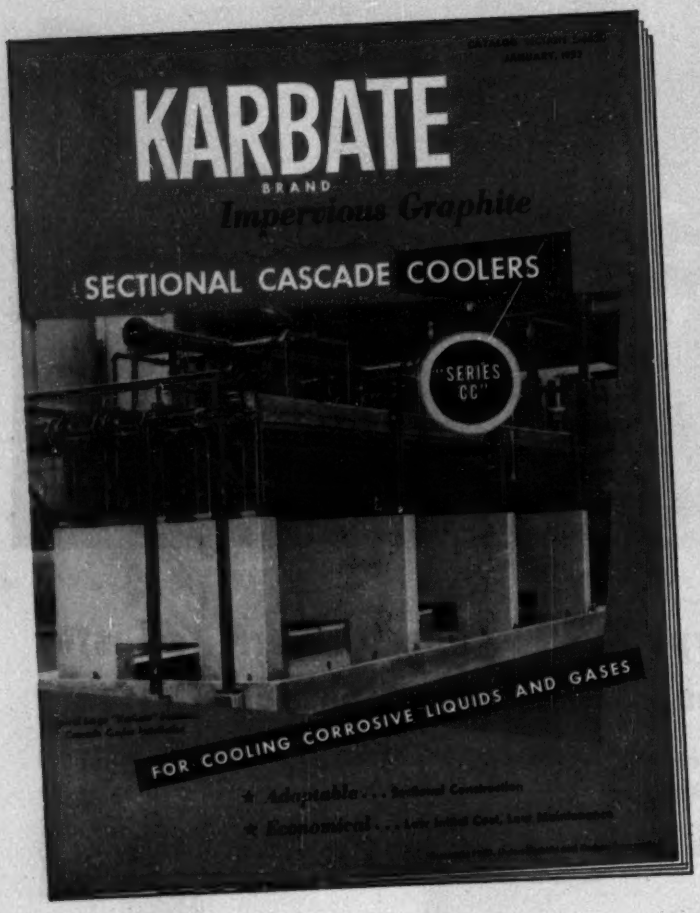
American Air Filter
COMPANY, INC.

AAF

326 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

NATIONAL CARBON OFFERS

GREATER VALUES IN...



NEW "SERIES CC" "KARBATE" BRAND SECTIONAL CASCADE COOLERS

- HIGH HEAT TRANSFER RATE
- LOW INITIAL COST
- HIGH COOLING WATER CAPACITY
- TYPE SN ARMORED CONNECTIONS
- RADIUSED RETURNS FOR LOW PRESSURE DROP
- REDWOOD WATER GUIDE STRIPS
- "TEFLON" GASKETS
- *THREE* STANDARD MODELS AVAILABLE FROM STOCK

...ALL "KARBATE" BRAND EQUIPMENT GIVES YOU:

- OUTSTANDING CORROSION RESISTANCE
- COMPLETE IMMUNITY TO THERMAL SHOCK
- FREEDOM FROM METALLIC CONTAMINATION
- LONG LIFE—LOW MAINTENANCE

...A CONSTANTLY IMPROVING LINE

Specify "National" Carbon and Graphite and "Karbate" Impervious Graphite Equipment for Processing, Conveying and Storing Corrosive Fluids.

HEAT EXCHANGERS
Wide variety of standard and custom-built models in time-proved designs. Shell and tube, concentric and immersion types available in stock sizes. Catalog Sections S-6620, S-6670, S-6740, S-6750.

PUMPS
The centrifugal pump for handling corrosive fluids. Rugged, trouble-free design. Handling capacities to 800 G.P.M. Catalog Section S-7200.

PIPE, FITTINGS and VALVES
Handle industry's toughest fluid conveying requirements. Easy to install and maintain with simple hand tools. Catalog Section S-7000.

BRICK
Accepted material for lining tanks, towers, digesters and other vessels containing corrosive chemicals. Catalog Section S-6210.

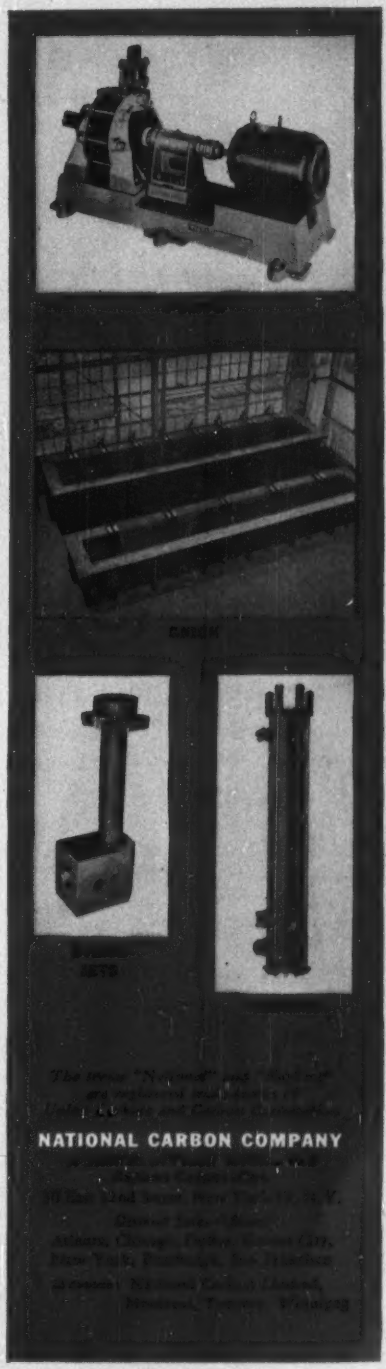
GROUND ANODES
"National" Graphite Ground Anodes for cathodic protection of buried or submerged metal structures. Catalog Section S-6510.

STEAM JETS
For heating and agitating corrosive solutions by direct injection of steam. Catalog Section S-7300.

TOWERS
For absorption, fractionation and scrubbing. Easily erected from standard monolithic sections and components. Catalog Section S-7350.

HCL COMBUSTION CHAMBERS
Versatile, standard equipment for hydrogen chloride synthesis. Burns moist gases. Simple in operation. Catalog Section S-7530.

HCL ABSORBERS
Standard and custom-built models to meet *any* hydrochloric acid production requirement. Catalog Section S-7430.



NATIONAL CARBON COMPANY

Names in the News Edited by Frances Arne

". . . our society will decay or explode . . ."

Man of the month:

Richard H. Wilhelm

Often called Princeton's "humanist in engineering" he's winner of 1952 Professional Progress Award in Chemical Engineering.

Rounding the corner of our desk, a fellow editor did a double take—"Is that Dick Wilhelm? I never saw him look that serious." A glossy print of the above photograph was on view on the desk.

Said editor, who had taken an extension course with Wilhelm, enthusiastically threw in with student-directed "Faculty Popularity Polls" at Princeton which year after year have given the professor top rating. And it seems that about the only time Dick Wilhelm, for 18 years a member of Princeton's chemical engineering department, cannot smile is when he is going through the ordeal of having his picture taken.

Smiling or not, the articulate, energetic Wilhelm takes a very serious interest not only in the technical and teaching aspects of his profession but in what might be called humanism in engineering. He summed up his feelings in a conference report a few years ago when he directed the Princeton Bicentennial Conference on "Engineering and Human Affairs."

". . . our society will decay or explode" if engineers and scientists persist in neglecting the "basic data and laws of social sciences." And he says ". . . the developments of science and engineering have in their results reached the point where the use of these developments cannot be dissociated from a moral responsibility for the effects of their use on society." Acting on these beliefs, he has assisted in the evolution of a unique system of chemical engineering education which stresses ability in human relations.

He has helped others to see that the ever expanding field of chemical engineering occupies a strategic position between the pure sciences and all of the branches of engineering. For example, he was instrumental in organizing within Princeton's engineering science program, studies which combine elements of chemical engineering, biology, chemistry and mathematics and are expressly designed to provide an educational background for entry into the biological industry or into graduate studies.

On the technical side, Wilhelm has been a pioneer in the science of reaction kinetics as applied to chemical engineering. It is for this work that he has just received the Celanese-sponsored award from AIChE. Presented every year to a chemical engineer under 45, the award was given to Wilhelm, "For his distinguished contributions to the theories and experimental data of fluid mechanics, mass and heat transfer, and reaction rates, and for his special applications of these theories to fluidized solid systems and to biochemical and textile processing."

Last year, too, he was honored by AIChE. Then it was the William H. Walker Award.

With Princeton's department of chemical engineering since 1934 (the year it was founded), he reached the rank of professor in 1946. A native of New York City, Professor Wilhelm had received his B.S. degree in 1931 from Columbia School of Engineering, his Ch.E. in 1932, and in 1935 he received his Ph.D. degree in chemical engineering from the Columbia Graduate School, where he was Pulitzer scholar.

Associated with the research program of the Textile Research Institute, Wilhelm in World War II pushed projects for the National Defense Research Committee and later served as codirector of a high-priority undertaking sponsored by the Rubber Reserve Office. He is presently a consultant to the Dept. of Defense's research and development board and is a member of the management committee of the Chemical Sciences Laboratory of Princeton's Forrestal Research Center.

Some four or five years ago in seeking a hobby, Wilhelm took up oil-painting. His landscapes are superior. He only paints in the summers which he spends with his family (Mrs. Wilhelm; Karen, 9; Joan, 7; David, 3) at Deer Isle, Maine. But his works—one or two of which hang in his home—would be credits to a professional artist.

Wilhelm's other summertime relaxations are fishing (sea) and swimming. His extracurricular interests also include color photography and he recently completed a high-fidelity phonograph for the family living room.

(*Personals continued*)

Automatic Control

• Permutit motor operated valves make regeneration of the Mixed Bed Demineralizer completely automatic. This gives more positive control . . . eliminates the dangers of costly human errors—and takes less time . . . saves man-hours formerly spent in regeneration. In a recent installation for a 1450 psi boiler, two compact Permutit Mixed Bed units fill all make-up requirements . . . supply demineralized, silica-free water continuously and automatically—even if one unit is out of service. What better way to eliminate boiler scale and silica deposits on turbine blades!

MINERAL IMPURITIES REACH VANISHING POINT

An almost infinite number of ion exchange steps take place simultaneously in the homogeneous mixture of anion and cation exchangers. Result—mineral content so low that conventional water analysis methods fail. Effluents of Permutit Mixed Bed units have contained *total* electrolytes as low as 0.01 ppm, and silica as low as 0.01 ppm. Under service conditions, values may be slightly higher. (Most distilled water contains 2 to 10 ppm electrolytes . . . costs much more to produce.)

TWO AMAZING RESINS DO THE JOB

Highly efficient Permutit Q and Permutit S do the whole job under positive automatic control in the Mixed Bed Demineralizer. Permutit Q is a high capacity hydrogen cation exchange resin that is extremely resistant to wide pH ranges, high temperatures, and oxidizing conditions. Permutit S, a strongly basic resin with a high reaction rate, reduces silica to a range far lower than previous methods.

New Booklet—DEMINERALIZATION BY ION EXCHANGE

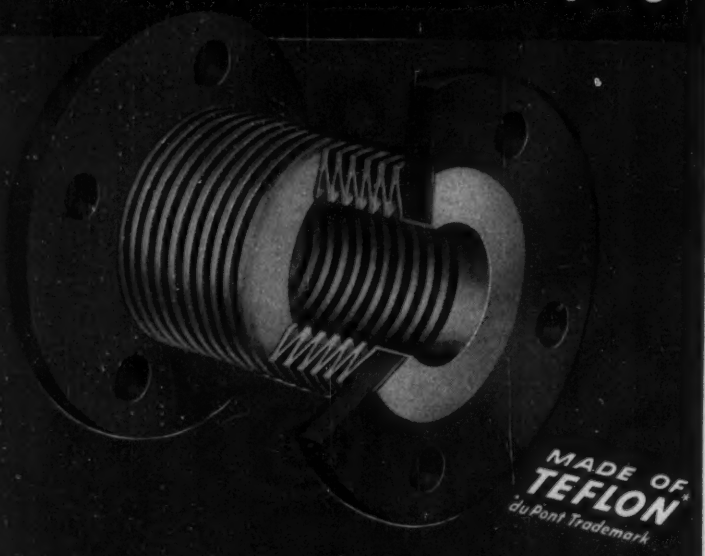
This interesting new bulletin describes the key methods of demineralizing water and removing silica by ion exchange.

For your copy, write to: THE PERMUTIT COMPANY, DEPT. CN-1, 330 WEST 42ND STREET, NEW YORK 36, N. Y., or Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

PERMUTIT

ION EXCHANGE AND WATER CONDITIONING HEADQUARTERS

SAFE SEALS
for Costly Chemical Piping



Chemseal Expansion Joints
and Flexible Couplings

- Absorb shock, vibration, thermal expansion and contraction.
- Correct misalignment.
- Connect rigid piping ends and eccentrics.
- Eliminate gaskets, adapters, slip joints.
- Made of TEFLON*—impervious to all chemicals except molten sodium and fluorine.
- Write for Bulletin FC-053

UNITED STATES GASKET COMPANY

FLUOROCARBON PRODUCTS DIVISION
CAMDEN 1, NEW JERSEY

Representatives in Principal Cities Throughout the World

NAMES IN THE NEWS, cont. . .

Francis W. Winn. Assistant chief process engineer for Catalytic Construction Co. Came to Catalytic from the research and development department of the Socony-Vacuum Oil Co. where he specialized for five years on process design and economic studies of refinery equipment.

Francis W. Winn

D. G. Patterson

Donald G. Patterson. Technical assistant on resins and plastics to the chairman of the board of Reichhold Chemicals, Inc., New York. For the past 15 years, in charge of plastics development at the research laboratories of American Cyanamid Co. at Stamford, Conn. Graduate of VMI.

Harry L. Fisher. President-elect of the ACS, he will head the society in 1954. Special assistant to the director of the office of synthetic rubber, RFC. Formerly director of organic research of U.S. Industrial Chemicals with whom he was associated from 1936 to 1950. Previous employers, B. F. Goodrich Co. and U.S. Rubber Co. Winner in 1949 of the Charles Goodyear Medal for outstanding achievement in the chemistry of rubber. Doctorate in organic chemistry from Columbia.

Charles Lathrop Parsons. First winner of a new ACS award to be given no more than once every three years to a chemist or chemical engineer for "outstanding public service." The award will be named for Dr. Parsons. Most of Dr. Parson's career was spent at the Bureau of Mines. In 1932 he received the Priestly Medal for his distinguished service to chemistry.

David B. Zipser. Chief engineer, refrigeration division, Tenney Engineering, Inc., Newark, N. J. Previously research engineer and later chief engineer for the Bush Mfg.

Co. Studied chemical engineering at Worcester Polytechnic Institute.

John H. Hennessey. Vice president of the Berkshire Color & Chemical Co. Formerly in charge of the vat colors department for General Dyestuff Corp. With the company for 29 years.

Francis A. Domino. Technical director, Buttle Chemical Co., Kenilworth, N. J. Formerly department head in production with the Givaudan Corp., Delawanna, N. J.

L. A. Melsheimer. Manager, technical promotion pigment department, Calco Chemical Division, American Cyanamid Co. Formerly in charge of the pigment department technical service laboratory. Chemical engineering graduate of the University of Virginia.

L. A. Melsheimer

J. H. Bruun

J. H. Bruun. Director of research, Hooker Electrochemical Co., Niagara Falls, N. Y. Has been with General Aniline and Film Corp. for the past 10 years as assistant to the vice president of operations, director of commercial development, director of research of the company's central research laboratories, acting works manager of its Renssalaer plant and director of the process development department. From 1932 to 1942, manager of the research division of Sun Oil Co. From 1927 to 1932, senior research associate in the National Bureau of Standards. Studied at the Norwegian Institute of Technology and Johns Hopkins.

Wilfred K. Wilson. Group leader, research and development department, Chemstrand Corp., Decatur, Ala. Previous positions: research chemist with Shawinigan Resins Corp., Springfield, Mass.; instructor in chemistry at the University of New Hampshire. Graduate of the University of New Hampshire.

Typical pipes and fittings of nonplasticized polyvinyl chlorides fabricated to specifications by Van Dorn.

Van Dorn

INDUSTRIAL PLASTICS OFFER YOU—

✓ **High Resistance to Acids & Alkalies**

✓ **Tensile Strength of Aluminum, with one-half its weight**

✓ **Readily Formed, Machined, Drawn Molded or Welded**

AVAILABLE FORMS

SHEETS . . . .1/32" through 1"
PIPE . . . . .½" through 6" diameter (10 ft. lengths)
ROUND BARS . ¼" through 2" diameter (10 ft. lengths)
WELDING ROD. ⅛" and 3/16" diameter

TYPICAL APPLICATIONS

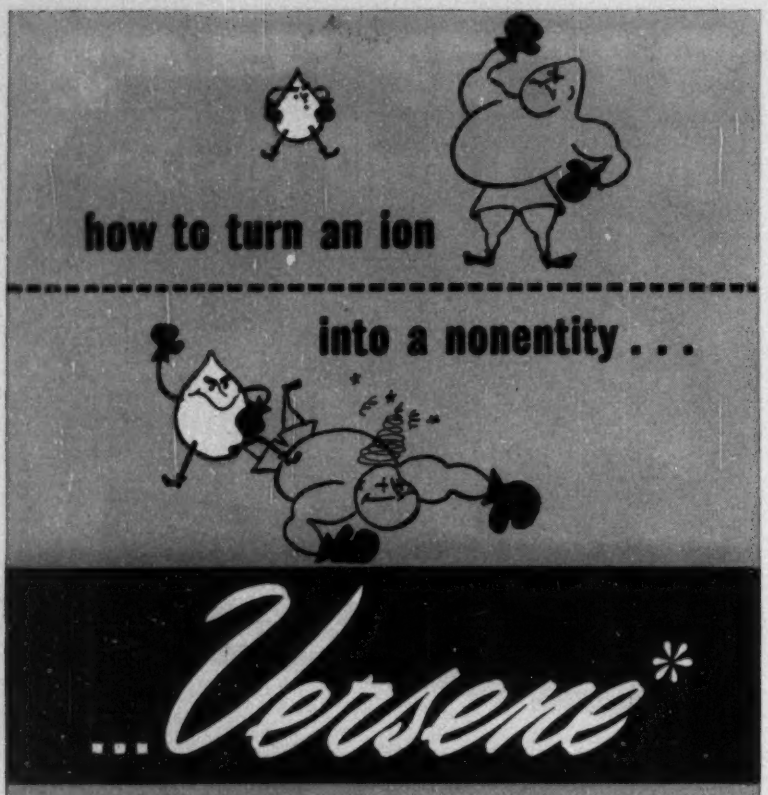
Van Dorn fabricates its rigid nonplasticized polyvinyl chlorides into such products as: Ducts, Hoods, Chemical Tanks, Tank Liners, Plating Racks, Fume Stacks and Piping.

WRITE FOR ILLUSTRATED BULLETIN AND SPECIFICATIONS

INDUSTRIAL PLASTICS DIVISION

THE VAN DORN IRON WORKS CO.

2685 East 79th Street • Cleveland 4, Ohio



CHEMISTRY OF CHELATION

To turn "somebody" into "nobody" you remove him from his environment and prevent him from exerting further influence on it. Essentially, this is what you do when you use Versene* and the Chemistry of Chelation to make metallic ions lose their chemical identities. When metal ions form a complex compound with Versene, they become so strongly attached to the Versene that they lose their identity and can no longer interfere with or influence their environment in any way.

CHELATION IS THE KEY

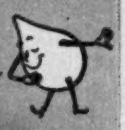
In other words, Chelation and the Versenes* (powerful Chelating Agents) may well be the solution to your chemical problem — especially if it involves metallic ion contamination in any kind of liquid formulation.

GUARANTEED QUALITY

Made only under processes originated, developed and patented by F. C. Bersworth, the Versenes* are exceptionally stable at elevated temperatures and all pH's. Quality standards of manufacture are so high that uniform complexing power is guaranteed in both sample and carload quantities. Find out now how these most powerful Chelating Agents can help you. Write Dept. B for Technical Bulletin #2 and samples. Chemical counsel available.

*Trade Mark Registered.

VERSENE WATER TEST KIT. Tells total hardness in 2 minutes. Accurate to 1 grain per gal. Complete with instructions $5.00 postpaid.



"Chemistry's most precise chemicals"

BERSWORTH CHEMICAL CO.

FRAMINGHAM, MASSACHUSETTS

WAREHOUSE STOCKS

Providence Agent: George Mann & Co., Inc., 251 Fox Point Boulevard, Providence, R.I.
W. Coast Agent: Griffin Chemical Co., San Francisco, Los Angeles
Midwest Agent: Kraft Chemical Co., Inc., 917 W. 18th Street, Chicago
Wasatch Chemical Co., Salt Lake City, Utah
Southwest Agents: Berado & Page, Inc., Dallas, Houston, Kansas City, etc.
Chas S. Tanner Co., 1815 Liberty Life Bldg., Charlotte, North Carolina

New members of the research and development department: **Alton E. Peacock** formerly a research chemist with Monsanto, at Everett, Mass.; **Paul W. Gann** formerly a research engineer for Monsanto at Dayton, Ohio; **Calvin J. Waitkus** formerly a research chemist with American Viscose at Marcus Hook.

Wilfred J. Mohr. Manufacturing manager, Southern Latex Corp., Austell, Ga. Has been technical sales director for the Rubber and Asbestos Corp., Bloomfield, N. J. Previous employers: Flintkote Co.; Minnesota Mining & Mfg. Co.

Ernest Welles. Research chemist, Dexter Chemical Corp., New York. Formerly group leader with Foster D. Snell, Inc., New York.

R. W. Schramm. From manager of market research to staff specialist in the development department, Spencer Chemical Co. Joined the company in 1949. Studied chemical engineering at Notre Dame.

W. J. Swigert. Production assistant, American Cyanamid's nitrogen products plant under construction near New Orleans. Formerly production superintendent of the company's plant at Marietta, Ohio.

John I. Hughes. Supervisor, research division at the Wilmington experimental station of DuPont's polychemicals department. Posts during 11 years with the firm: chemical engineer, technical section, Belle, W. Va.; technical superintendent of the scouting and planning groups and one of the plant research groups; assistant superintendent of the nylon division in the operation section; member of the planning division of the polychemicals department. Chemical engineering graduate of the University of Minnesota.

William N. Lacey and **Bruce H. Sage.** Recipients of certificates of appreciation from the American Petroleum Institute. Both men are professors of chemical engineering at California Institute of Technology.

Bernard Vonnegut. New member of the physical chemistry group of Arthur D. Little, Inc. Known for his

TYPE E turbines can handle it!

Spencer Chemical Company of Pittsburg, Kansas, has a total of ten 47-hp Type E turbines for driving blowers. Units are mounted outdoors on structural steel and are exposed not only to the elements, but to a corrosive ammonium-nitrate atmosphere.

Continued satisfactory operation of the turbines under these conditions is proof that the Type E can "take it" . . . proof that Type E construction keeps foreign matter out . . . proof that materials used resist corrosion and erosion.

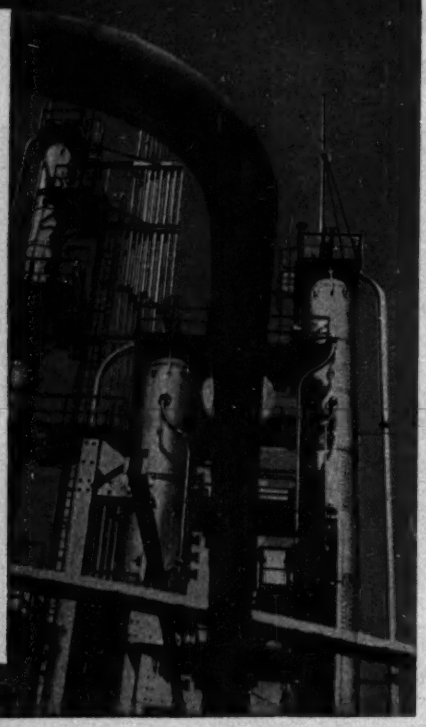
Weather and corrosion resistance are important . . . in the chemical industry and in other industries as well. Important, too, are other Type E features, such as dual protection against overspeed, floating movement of governing and trip linkages, centerline support, parts interchangeability between wheel sizes. Outstanding Type E design assures safe, trouble-free, economical performance for long periods of continuous operation . . . or instant operation when used as a stand-by drive.

Other types in the complete Westinghouse general-purpose turbine line include heavy-duty and multistage units.

Get the facts from your nearby Westinghouse office, or write for twenty-page book B-3896. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-50542

YOU CAN BE SURE...IF IT'S
Westinghouse
TYPE E Turbines

YOU CAN STOP liquid carry-over in processing vessels WITH METEX MIST ELIMINATORS



The unusually high efficiency with which these *knitted* wire mesh units remove the liquid entrainment that occurs in a wide variety of refining and processing operations has enabled engineers to:

1. Improve product quality and eliminate reruns.
2. Prevent contamination in subsequent operations.
3. Recover valuable products previously lost.
4. Operate existing equipment at higher capacities.
5. Design new equipment with smaller dimensions.
6. Achieve more economical processing of lower grade materials.
7. Secure longer "on-stream" periods by removing corrosive liquids.
8. Prevent air pollution by objectionable liquids.

METEX Mist Eliminators can be used *wherever* the problem of liquid entrainment exists. By effecting complete removal of liquids, Mist Eliminators contribute to more efficient and economical processing in such vessels as:

VACUUM PIPE STILLS	EVAPORATORS	COMPRESSORS
FRACTIONATING TOWERS	ABSORBERS	SEPARATORS
KNOCK-OUT DRUMS	SCRUBBERS	STEAM DRUMS

Get the full facts on METEX Mist Eliminators

Write for bulletins giving detailed information — including limiting velocities, pressure drop, efficiencies, etc.

METAL TEXTILE CORPORATION

KNITTERS OF WIRE MESH FOR MORE THAN A QUARTER CENTURY

Main Office & Plant, Roselle, New Jersey Canadian Plant, Hamilton, Ont.

pioneering work in rain-making by seeding clouds with silver iodide. Some previous employers: General Electric Co.; Preston Laboratories; Hartford Empire Co. Doctorate from MIT.

H. W. Haines, Jr.

Martin Fields

Harry W. Haines, Jr. Development engineer, Vulcan Engineering Division, Cincinnati. Formerly a fellow of the Mellon Institute of Industrial Research, Pittsburgh. Studied chemical engineering at the universities of Illinois and Pittsburgh. New assistant project engineer with Vulcan: **Martin Fields.** Previously a chemical engineer with Takamine Laboratories, Clifton, N. Y. Masters in chemical engineering from NYU.

Roger G. Richards. Technical liaison man in the organization of diamond Alkali Corp., Painesville, Ohio. Formerly employed in the research and development laboratories of Monsanto's plastic division at Springfield, Mass.

Robert C. Hockett. Associated with Arthur D. Little to act as consultant between that firm and clients in the fields of nutrition, pharmaceuticals and organic chemistry. From 1943 to 1952, scientific director of the Sugar Research Foundation. Between 1936 and 1943, did consulting work for major pharmaceutical, chemical and consulting firms. Doctorate from Ohio State.

Harold C. Urey. Appointed the Martin A. Ryerson distinguished service professor of chemistry at the University of Chicago. Joined the university's faculty in 1945. Recipient of the Nobel prize for his discovery of heavy water. Was one of the leaders of the Manhattan District Project. During the war, director of war research of the SAM

Laboratories at Columbia. Doctorate from the University of California.

Fred Whittier. Supervisor of bituminous coatings research and development department at the Neville Island operations of Pittsburgh Coke & Chemical Co. Came to the company in 1951 from U. S. Testing Co. Before that, with the Barrett Division, Allied Chemical and Dye.

Robert Evans. New member of the chemical division of the University of Denver institute of industrial research. Has taught at the University of Wisconsin and the Colorado School of Mines. Doctorate from the University of Wisconsin.

William S. Richardson. A director and executive vice president of B. F. Goodrich Co. Has been a vice president since 1951; has been president of B. F. Goodrich Chemical Co. since 1945. Vice president of the Manufacturing Chemists Assn. With the Goodrich organization since 1926.

W. S. Richardson

C. A. Thomas

Charles Allen Thomas. Recipient for 1953 of the Perkin Medal awarded by the American section of the Society of Chemical Industry for outstanding achievement in applied chemistry. President of Monsanto since 1951. Previously served the company as central research director, technical director, vice president and director, member, vice chairman and chairman of the executive committee and as executive vice president. Came to Monsanto in 1936.

Jean R. Okel. Division engineer, Monsanto Chemical Co.'s Western Division. Came to Monsanto in 1942 as a production supervisor in the organic chemicals division's John F. Queeny plant in St. Louis. Made project engineer in 1946; in 1948,

USE Bemis

Waterproof Laminated-Textile Bags

FOR YOUR HARD-TO-PACK PRODUCTS

GET 5-WAY PROTECTION
...they guard against:

- Change of moisture content
- Sifting
- Escape of undesirable odors
- Loss from snagging and tearing
- Rough handling in l. c. l., truck or export shipment

3- or 5-layer construction depending on your protection requirements. Special linings of treated papers and films available.

Bemis

408-R Pine St.
St. Louis 2, Mo.

Maybe You Need These, Too

If you don't require the exceptional protection of Bemis Waterproof Bags, Bemis Multiwall, Flexiply (laminated crinkled multiwall), Cotton or Burlap Bags are your best bet.

Whatever Kind of Bag You Need, WE MAKE IT!

POTTER Electronic FLOWMETER

Measures Flow Within 1/2%

. . . at pressures to 20,000 psi
. . . of caustics or corrosives
. . . from .09 to 6,000 gpm
. . . from —450 to +1200° F

The Potter Flowmeter does things no other flowmeter can do, because it is based on a new principle of flow measurement. It is inherently linear—eliminating bells, cams and mechanical inaccuracies; and it requires no air purges or diaphragm seals for use with hard-to-handle fluids.

Flow Sensing Element

The basis for all Potter Flow Metering Systems is the unique turbine-type rotor, which is designed so that it spins—without slippage or friction—at a rate that is proportional to the flow through the unit. The Sensing Element contains a small permanent magnet, which induces an alternating voltage in a pickup coil mounted outside the housing. The frequency of this voltage is linearly proportional to flow over ranges as great as 25-1.

Converter

The Potter Converter produces a smooth dc output which is proportional to the frequency of the ac input from the Sensing Element. The unit is easily calibrated, using an internal frequency standard, and has a fast response speed which permits its use for the measurement of rapidly-changing flows. Available with built-in totalizer in multiple-input models and with specific gravity compensation for the measurement of mass flow.

Accuracy of the system will be well within ½ % of true flow over the normal operating range.

Instrument

The Sensing Element and Converter will operate any standard indicating or recording instrument having a span of 0-1 ma and a nominal internal resistance of 50 ohms. Any evenly-graduated chart or scale can be used to read directly in flow units.

For Further Details . . . . .

Send for further information on this equipment for your flow metering applications. Specify whether you are primarily interested in Laboratory, Industrial, or Airborne instruments.

POTTER AERONAUTICAL CO. 87 Academy Street, Newark 2, N. J.

NAMES IN THE NEWS, cont. . .

development superintendent of that plant; in 1951, assistant to the executive vice president.

William H. Millett. Transferred from the Tonawanda laboratories of Linde Air Products Co. to the special products division of Carbide and Carbon Chemicals Co. in New York. Before World War II, a member of Carbide and Carbon's organic synthesis fellowship at Mellon Institute.

W. H. Millett

R. F. Phillips

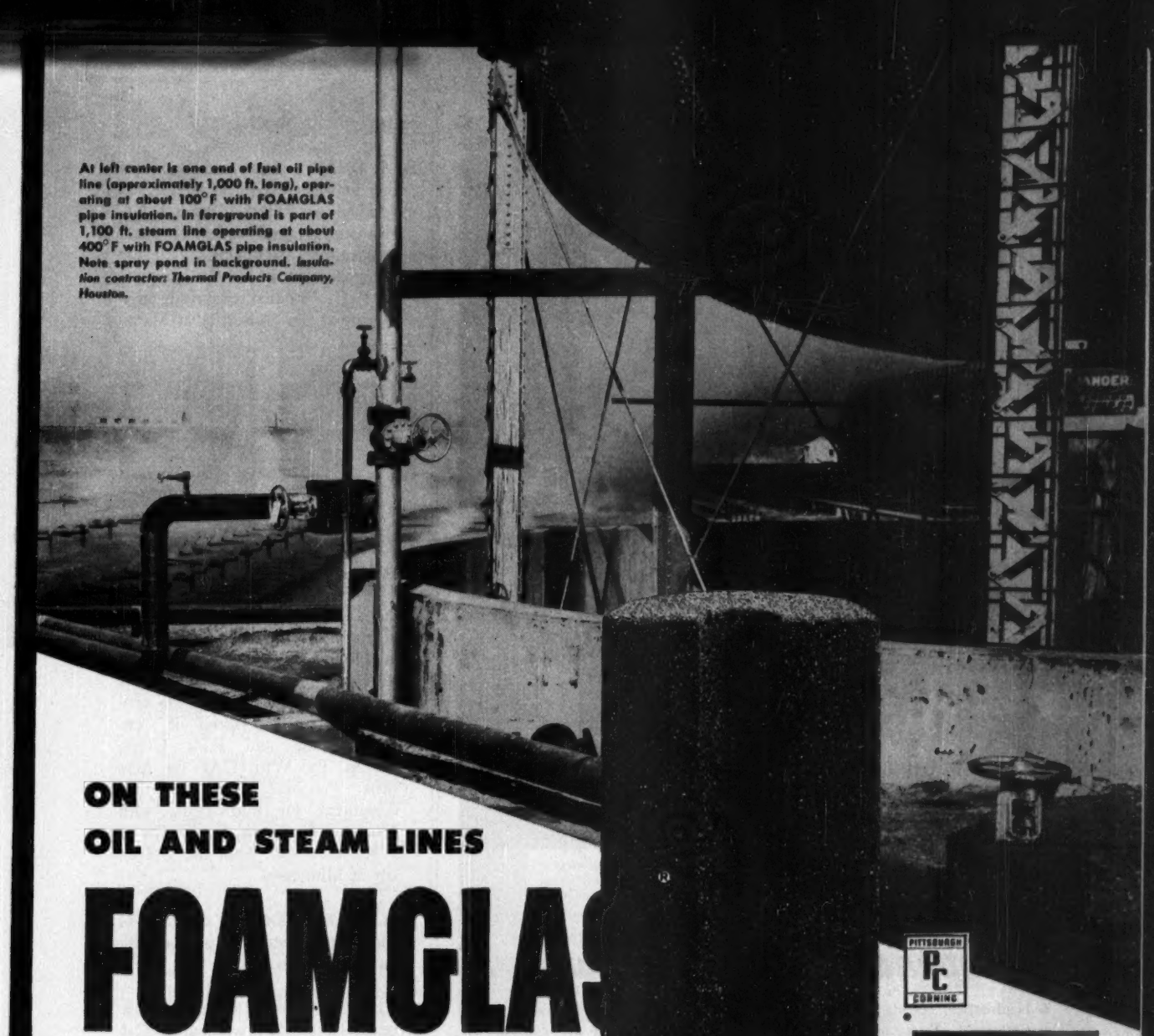
Ralph F. Phillips. Development manager, Evans Research and Development Corp., New York. Formerly assistant scientific director of the Sugar Research Foundation. Doctorate from MIT.

Charlene M. Moore and **Jack Moss.** Research assistants in chemistry on the staff at Sterling-Winthrop Research Institute, Rensselaer, N. Y. Miss Moore is a Cornell graduate, Mr. Moss of Bradford Durfee Technical Institute.

Walter Harris. New member of the Edwal Laboratories engineering staff at Ringwood, Ill. Previously associated with the Wilson Laboratories. Chemical engineering graduate of Illinois Institute of Technology.

Paul Sanders. Assistant manager of General Petroleum's Torrance, Calif., refinery. With the company 33 years and superintendent of the refinery since 1945. His successor. E. G. Surber.

Charles J. Krueck. Supervising engineer, Blatz Brewing Co. With Schenley Industries, Blatz parent organization, since 1946. Previously plant superintendent for the National Lead Co. Chemical engineering graduate of the University of Cincinnati.



At left center is one end of fuel oil pipe line (approximately 1,000 ft. long), operating at about 100° F with FOAMGLAS pipe insulation. In foreground is part of 1,100 ft. steam line operating at about 400° F with FOAMGLAS pipe insulation. Note spray pond in background. *Insulation contractor: Thermal Products Company, Houston.*

ON THESE OIL AND STEAM LINES

FOAMGLAS®

insulation spends most of its time under a shower but STAYS DRY

Keeping dry under a shower is a slick trick, but magic FOAMGLAS is the one insulation that can do it, day in and day out. That's one big reason why Dallas Power & Light Company chose FOAMGLAS to insulate oil and steam lines running right next to a spray pond handling concentrated alkaline water.

Chief Engineer R. D. Elliott points out, "The combination of water and chemicals really requires an extraordinary insulation, and we've found that neither moisture nor chemicals can penetrate the closed, inorganic cell structure of FOAMGLAS. That's why we count on it to combat corrosion and to maintain constant insulation efficiency."

PITTSBURGH CORNING CORPORATION
PITTSBURGH 22, PA.

PITTSBURGH PC CORNING

R. D. Elliott

Pittsburgh Corning Corporation, Dept. H-23
Pittsburgh 22, Pa.

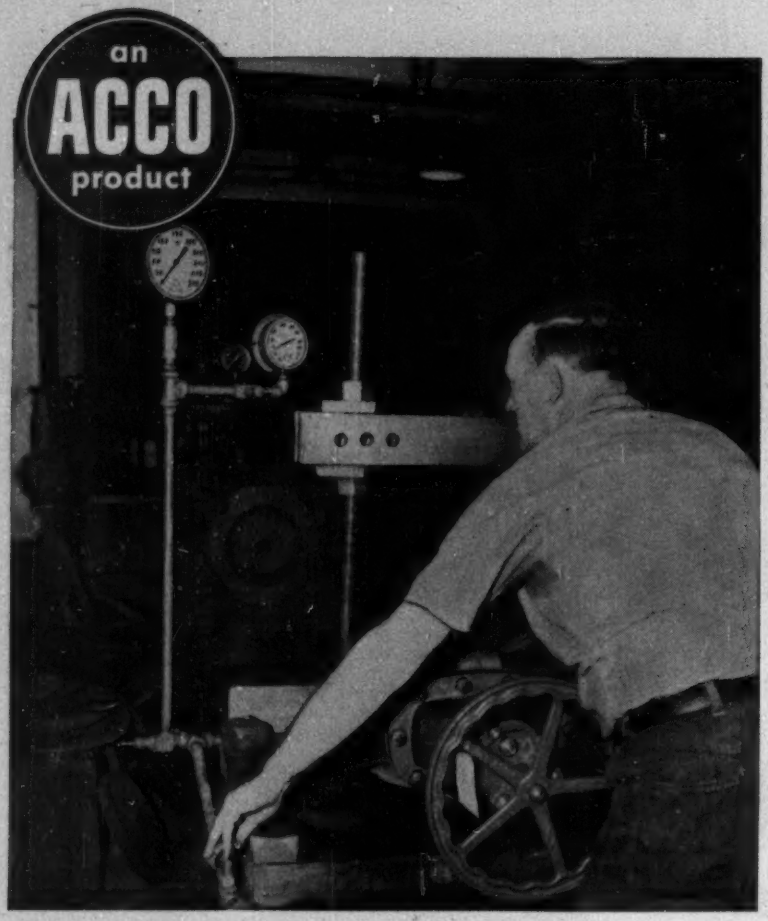
Please send me free sample and booklets on use of FOAMGLAS for:

☐ Piping and process equipment ☐ Refrigerated Structures
☐ Normal Temperature Buildings
☐ Advise nearest source of supply
☐ Send engineer to discuss specific problem

NAME _____ TITLE

COMPANY _____

CITY _____ ZONE STATE



Why HELICOID Gages Prove So Dependable, So Much Longer...

● Hydrostatic testing of valves on production lines gives gages a continuous workout. Every few minutes, all day long, high pressure water is run into valve after valve. Each time the gage surges up, levels off, and then suddenly drops back to zero.

Wear on gear teeth would be a constant headache—BUT not with a HELICOID Gage because—*it doesn't have teeth!* A simple stainless steel roller and long life cam absorb the surges and practically eliminate wear. Consequently, a HELICOID Gage after thousands of cycles is just as good as the day it was made.

Here you see Helicoid Gages on a hydraulic application. You can also get HELICOID Gages for pressure, vacuum, or compound service—in all pressure ranges; in various sizes and shapes; with black, white, and radiant faces; wall, stem, flush, and panel mountings, or flangeless cases.

Write today for full details on HELICOID Gages —they retain original accuracy longer, last longer, cost less per gage, per year.

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE

929 Connecticut Avenue • Bridgeport 2, Connecticut

HELICOID
Pressure • Vacuum
GAGES

R. A. Lindsay. Heavy industries section manager, technical service and development, Dow Chemical Co. Has been section head of chemical engineering products, organic chemical sales. Joined the company in 1941. Studied chemical engineering at the University of Michigan.

R. A. Lindsay

D. L. Fuller

Donald L. Fuller. Technical director of American Cyanamid's nitrogen products plant now under construction near New Orleans. Has been associate director of the central research laboratories of General Aniline and Film Corp., Easton, Pa. With GAF for nine years. Previously with Shell Development for four years; with American Cyanamid from 1935 to 1938. Doctorate from the University of Minnesota.

Jean R. Okel. Division engineer of Monsanto's western division with headquarters in Seattle.

C. E. McKim. Works manager of National Carbide's new plant at Calvert City. Has been works manager at the company's Louisville plant. Joined the company in 1929.

Merle F. Schreurs. To head the practical fabric coating techniques and processes section, plastics materials group, B. F. Goodrich Chemical Co. Previous employers: Textileather Corp. and Industrial Ovens Inc. Chemical engineering graduate of Iowa State.

W. S. Munro. Manager of Monsanto's western division plant in Seattle. Has been the division's chief chemical engineer since 1947. Came to Monsanto in 1944 along with I. F. Laucks, Inc., for whom he had been a chemical engineer since 1941. Before that, chemist for Standard Oil at Richmond

Calif. Degree in chemical engineering from the University of Washington.

James C. Brown. Civilian chemist for the Navy in Guam. For the past nine years a chemist at the General Electric chemical division at Pittsfield, Mass.

J. B. Mitchelson

W. H. Taylor

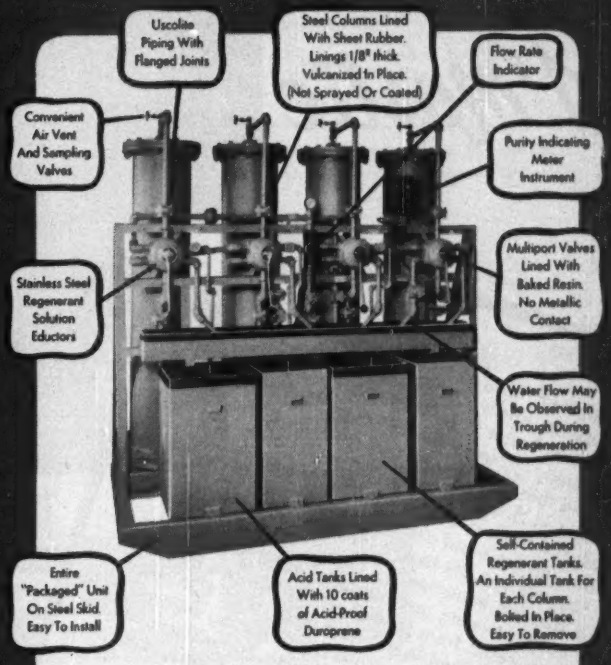
Jay B. Mitchelson. Superintendent of chemical operation at the government's gigantic uranium-235 plant which is under construction in southern Ohio and which will be operated by Goodyear Atomic Corp. Formerly assistant manager of Goodyear Tire & Rubber Co.'s chemical engineering division at Akron. Superintendent of design and development at the new plant: **William H. Taylor,** section head in the parent company's research organization since 1947. With the company since 1927. MIT graduate.

D. I. Weisblat. Assistant director of research, Upjohn Co. Has been head of the company's department of chemistry since 1950. Joined the company as a research chemist in 1943. Doctorate from Ohio State. His successor as head of the research division's chemistry department: **R. H. Levin** who has been a group leader in the company's chemistry research department for the past few years.

W. E. Santoro. Head of the research division, Monroe Sander Corp., Long Island City, N. Y. Formerly with Standard-Toch Chemical Co., Staten Island, N. Y.

Robinson Ord. Vice president of Canadian Chemical & Cellulose Co., Ltd. and vice president and general manager of Canadian Chemical Co., Ltd. Since 1945, general manager of sales for the organic chemicals division of Monsanto.

BARNSTEAD
WATER DEMINERALIZERS *are* BUILT BETTER


Uscolite Piping With Flanged Joints
Steel Columns Lined With Sheet Rubber. Linings 1/8" thick. Vulcanized In Place. (Not Sprayed Or Coated)
Flow Rate Indicator
Convenient Air Vent And Sampling Valves
Purity Indicating Meter Instrument
Stainless Steel Regenerant Solution Eductors
Multiport Valves Lined With Baked Resin. No Metallic Contact
Water Flow May Be Observed In Trough During Regeneration
Entire "Packaged" Unit On Steel Skid. Easy To Install
Acid Tanks Lined With 10 coats of Acid-Proof Duroprene
Self-Contained Regenerant Tanks. An Individual Tank For Each Column. Bolted In Place. Easy To Remove

Barnstead Water Demineralizers are *engineered* to give you long, trouble-free service . . . they are scientifically designed to produce Pure Water — and water of *standardized, controlled* quality for as low as 5c per 1000 gallons.

Now, Barnstead Demineralizers can be used profitably in countless operations and in every industry that is plagued by the uncertainties of tap water. Demineralized Water, by Barnstead, insures *better* products, *consistent* results, *fewer* rejects, and *lower* operating costs.

Whether you need 5 or 1000 gallons per hour, Barnstead engineers will be glad to help you find the right answers for *your* specific Pure Water problem. This service is yours for the asking.

FIRST IN PURE WATER SINCE 1878

TRADE MARK REG. U.S. PAT. OFF.

Barnstead
STILL & STERILIZER CO.

BARNSTEAD STILL & STERILIZER CO.
4 Lanesville Terrace, Forest Hills, Boston 31, Mass.
Gentlemen: Please, send me the complete Pure Water story on Barnstead Demineralizers.

Name_____ Firm_____

Address_____

City_____ Zone_____ State_____

Workmen love to use foster H.I. Mastic

Application of H. I. Mastic to interior of freezer room (Foster Specification I).

No other fibrated asphalt emulsion responds so easily, trowels or sprays so easily, as Foster H. I. Mastic 90-7. Workmen enjoy the smoothness of its application —and they know they won't have to patch cracks in H. I. Mastic around corners of insulated tanks and equipment, as they must do with the usual asphalt weathercoating. Easy workability makes for reduced labor costs in applied insulation.

The easy troweling and rugged durability of Foster H. I. Mastic result from specialized formulation for the job to be done; and users' confidence in H. I. Mastic is assured by our exacting care in maintaining uniformity. U.S. patent 2,129,416 protects Foster's unique combination of asbestos fibers, colloidal clay, and blended petroleum asphalts.

Ideal as a weatherproof and breathing surface on insulation for heated tanks, pipe lines, ducts, and other equipment, H. I. Mastic is also appropriate as an insulation surface coating inside cooler or freezer rooms. In fact, wherever you need an economical breathing mastic coating that won't shrink and crack from weathering, or deteriorate under rough treatment, there's a job for Foster H. I. Mastic 90-7.

H. I. Mastic has not cracked or shrunk at this critical corner of insulated outdoor tank. Application is Foster Specification J.

BENJAMIN **foster** COMPANY

4635-37 W. Girard Ave., Philadelphia 31, Pa.

See the Foster catalog in Sweet's Plant Engineering and Industrial Construction Files for 1953

Kenneth Dorman. Chief chemist at Goodall-Sanford Co., Sanford, Me. Graduate of MIT.

F. H. Catterson

R. M. O'Flyng

F. H. Catterson. Assistant general production manager, amino products division, International Minerals & Chemical Corp., Chicago. His successor as resident production manager of the firm's San Jose, Calif., plant: **R. M. O'Flyng,** formerly manager of the amino products division's development department. Mr. O'Flyng's successor; **E. M. Card** who has been senior project engineer in the devolpment department since 1949. Mr. Card's successor: **Francis R. Calton** who has been a project chemical engineer in the development department. New plant engineer for the amino products division: **A. E. Roeske** who retains his responsibilities as plant engineer at San Jose.

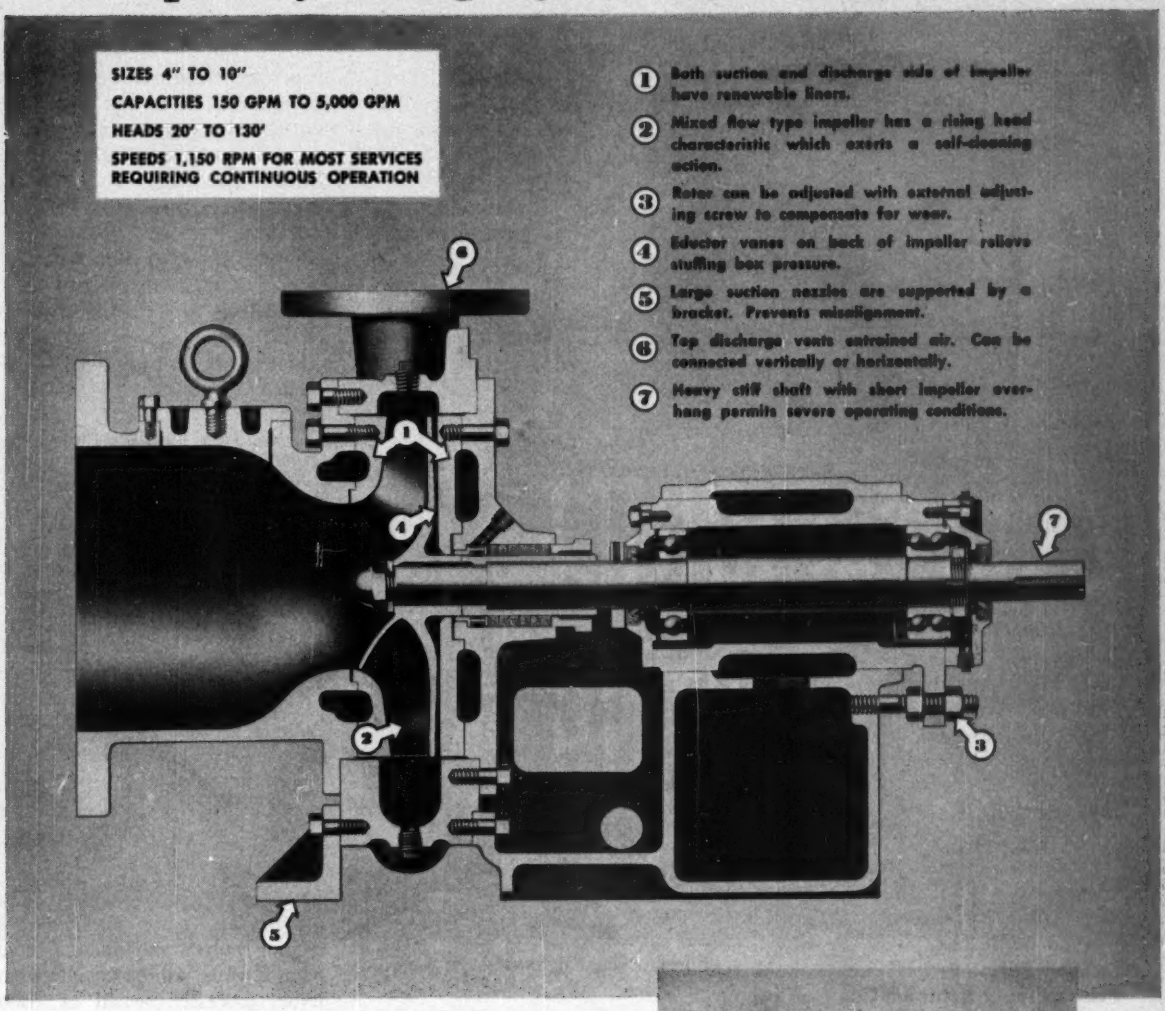
OBITUARIES

Hermon C. Cooper, 76, who had been a research chemist for the Norton Co., Worcester, Mass. between 1935 and 1946, died in Providence, R. I., November 16. He was a professor of chemistry at Syracuse University from 1901 to 1918. Later he was head of the division of electrochemistry and physics of the College of the City of New York. Studied at Beloit College, Wis., and in Heidelberg, Germany.

Harold E. McNab, 45, of Mack Chemical Co., Knoxville, Tenn., died November 21.

Vladimir N. Ipatieff, 85, world famed chemist and pioneer in the development of high octane gasoline, died in Chicago November 29. He was director of the chemical division of the Universal Oil Products Co. and a professor emeritus of Northwestern University.

Simplicity, long life, easy maintenance


SIZES 4" TO 10"
CAPACITIES 150 GPM TO 5,000 GPM
HEADS 20' TO 130'
SPEEDS 1,150 RPM FOR MOST SERVICES REQUIRING CONTINUOUS OPERATION
1 Both suction and discharge side of impeller have renewable liners.
2 Mixed flow type impeller has a rising head characteristic which exerts a self-cleaning action.
3 Rotor can be adjusted with external adjusting screw to compensate for wear.
4 Eductor vanes on back of impeller relieve stuffing box pressure.
5 Large suction nozzles are supported by a bracket. Prevents misalignment.
6 Top discharge vents entrained air. Can be connected vertically or horizontally.
7 Heavy stiff shaft with short impeller overhang permits severe operating conditions.

You get them all with...

DE LAVAL
STOCK PUMPS

Look at the seven outstanding features shown in the cross-section and you'll see why De Laval type CS Stock Pumps stay on the job for years . . . trim maintenance costs. Stock flows freely through a large suction nozzle, an exceptionally large throat area and an unbroken streamlined volute. This minimizes clogging, contributes to high hydraulic efficiencies, lowers inlet velocities, permits the handling of high stock densities with low submergences and prevents de-watering of free stock.

Write today for Bulletin 1100 giving full application and specification data.

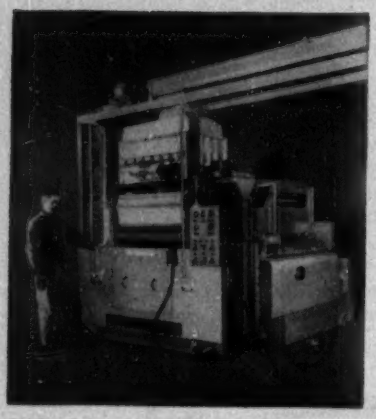
DE LAVAL *Stock Pumps*

DE LAVAL STEAM TURBINE COMPANY
Nottingham Way, Trenton 2, New Jersey

DL-143

Industrial Notes

NEW LINES



SPO, Inc., New York—Shellmolding machine equipped with automatic metering, sand-resin-mix recharge feeder (see cut) and a complete line of shellmolding machinery and auxiliary. SPO will manufacture and distribute this new line as a result of a recent agreement to link its facilities with those of Shellmold & Machine Co., New York.

American Box Co., Cleveland—New low-cost, light-weight wirebound container for shipment of liquid chemicals. The container is meant to replace the conventional nailed-wood bottle box.

Plastex Pipe & Extrusion Co., Columbus, Ohio—Yellow plastic pipe designed for maximum visibility and durability. The pipe is guaranteed against fading or staining, rust, rot and corrosion.

Resistoflex Corp., Belleville, N. J.—Large polyethylene sheets in two types: straight polyethylene or polyethylene fiberglass fabric reinforced laminates. The reinforced material is said to permit the fabrication of relatively thin wall self-supporting structures.

Reichhold Chemicals, Inc.—Vinyl-type, latex emulsion synthetic resin vehicle known as Wallpol for making odorless, rubber base, flat wall finishes. Although this marks the company's debut in the vinyl field in America, similar vinyl-type emulsions have been made for almost a decade by Vinyl Products, Ltd., and Vinatex, Ltd., both of London, affiliates of Reichhold Chemicals, Ltd., England.

Toledo Porcelain Enamel Products Co., Toledo—Enameled steel roofing and siding material specially suited for individual building construction and repair. Called Vitri-Cor, it is said to offer complete protection against fire, corrosive gases, moisture, steam, smoke and salt air.

NEW LOCATIONS

American Wheelabrator & Equipment Corp., Mishawaka, has moved its New York district office to 53 Newark St. Bldg., Hoboken, N. J.

Durant Insulated Pipe Co. has moved to a new plant at Warren Way and Bay Rd., Palo Alto, Calif.

Schmieg Industries, Inc., Detroit manufacturer of dust collectors, has moved to a new and larger plant at 23930 Sherwood.

Centrico Inc., sole distributor in this country for Westfalia Separator AG, has moved its offices to 75 West Forest Ave., Englewood, N. J.

NEW SERVICES

R. S. Aries & Associates, New York—Planned maintenance and maintenance engineering service for those companies in the chemical process industries who wish to improve their maintenance practices, yet reduce the cost. The new service is being supervised by Jackson D. Leonard.

NEW REPRESENTATIVES

Monsanto Chemical Co., St. Louis, Mo., has appointed Socony-Vacuum Oil Co. a distributor of its Pydraul F-9 nonflammable type hydraulic fluid.

Insul-Mastic Corp. of America, Pittsburgh manufacturer of heavy industrial protective coatings, has appointed three coating applicators to represent it in the South: Industrial Insulators, Inc., Borger, Tex.; Ozark Insulation Co., Little Rock, Ark., and Rust-Proofing, Inc., Phoenix, Ariz.

Dewey and Almy Chemical Co., New York, has appointed Martin, Hoyt and Milne, San Francisco, as exclusive West Coast sales representative for the company's organic chemicals division.

Damascus Tube Co., Greenville, Pa., has appointed E. R. Staley & Co., St. Louis, Mo., as its sales representative in Arkansas, Colorado, Kansas, Missouri, Nebraska, Oklahoma and the southern half of Illinois.

Tempil Corp., New York manufacturer of a line of temperature indicating products, has appointed the welding products division of A. O. Smith Corp., Milwaukee, as distributors.

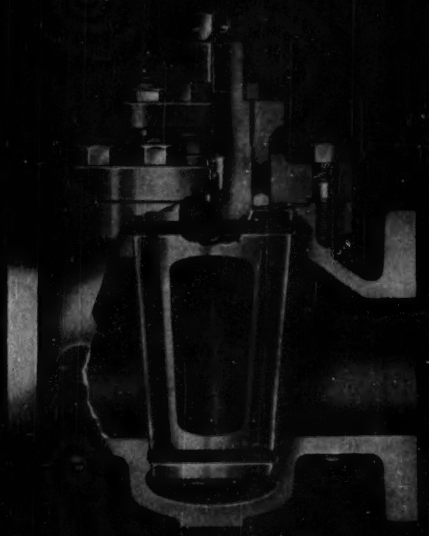
NEW COMPANIES

La Societe Monsanto-Boussois, S.A., to produce plastic materials, including polystyrene molding compounds which will be manufactured under processes owned by Monsanto and developed by its plastics division at Springfield, Mass. A plant will be built at Wingles, France. The new company is jointly owned by Monsanto and Compagnies Reunies des Glaces & Verres Speciaux de la France.

Quaid Fabrications, Inc., Philadelphia, to specialize in alloy metal fabrication.

American Messer Corp., New York, an affiliate and sole representative of Adolf Messer, G.m.g.H., Frankfurt, Germany, to supply U. S. manufacturers of oxygen and other gases derived from air with equipment of German design.

Hudson-Rush Co., Shreveport and Dallas, Tex., a manufacturers representative organization to specialize



W

LUBRICATED PLUG

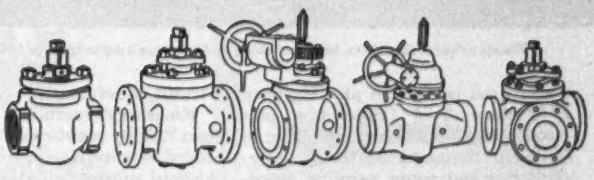
COMPLETE LINES OF LUBRICATED PLUG VALVES

Because of the wide range of services to which Lubricated Plug Valves can be adapted, they may be classed as "all-purpose" valves. Walworth manufactures complete lines of Lubricated Plug Valves in a variety of types and materials for working pressures up to 5,000 psi and for vacuum services. Sizes range from ½ to 30 inches. Write for descriptive literature.

Walworth also manufactures complete lines of gate, globe, angle, and check valves made of steel, bronze, iron, and special alloys.

Walworth valves, pipe fittings, and pipe wrenches total approximately 50,000 items and are sold through distributors all over the world.

Walworth engineers will be glad to help you with your problems. Call your local Walworth distributor, nearest Walworth sales office, or write to our General Offices, 60 East 42nd Street, New York 17, New York.



Illustrated in section is a Walworth No. 1700F Regular Gland Type, Wrench Operated, Steeliron, Lubricated Plug Valve. This particular line of valves has a working pressure rating of 200 psi at 150F or 125 psi at 450F. Sizes range from ½ to 8 inches. Other Walworth Lubricated Plug Valves include Single Gland and Ball Bearing types. They are available for a variety of working pressures.

For best results use Walworth Lubricants and Walworth High Pressure Lubricant Guns.

DISTRIBUTORS IN PRINCIPAL

Pangborn CH Dust Collectors installed outside the Kingsbury shop collect dust from painting and finishing operations via booths and hoods.

One Pangborn Installation Solves 6 Dust Control Problems!*

Hoods exhaust dust from hand polishing and grinding booths to outside Collectors

FINISHING operations at Kingsbury Machine Tool Corporation presented a 6-fold dust control problem to Pangborn engineers. Several priming, lacquering and spray painting operations had to be protected from dust created in other finishing jobs such as snagging, grinding and smoothing.

To control these dusts efficiently, Pangborn recommended booths, tables and exhaust hoods. Four main booths, four snagging tables, one snagging bench and a bench grinder hood control the dust at the source. All these are exhausted to two CH Collectors located out-of-doors.

Kingsbury reports the complete system "highly satisfactory"—with these added benefits: Heating costs have been lowered substantially through recirculation of the cleaned air. Costly dust damage to adjacent machinery and products has been prevented. And workers' efficiency has increased due to cleaner working conditions.

What are your Dust Problems? Find out what Pangborn can do to solve them. Write today for Bulletin 909A. Address: PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

INDUSTRIAL NOTES, cont. . .

in heat transfer equipment, controls for process industries and auxiliaries for large engines.

Bacon Industries, Inc., Watertown, Mass., to produce O-rings, gaskets and similar specialty products formerly manufactured by the Frederick S. Bacon Laboratories.

NEW FACILITIES

Link-Belt Co., Chicago—A 300,000-sq. ft. plant in Colmar, Pa., for the manufacture of custom-designed conveying and processing machinery on a straight-line production basis.

Buffalo Electro-Chemical Co.—A plant in Vancouver, Wash., constituting the first major expansion in the country's hydrogen peroxide facilities during recent years. This new supply source is capable of filling all West Coast requirements.

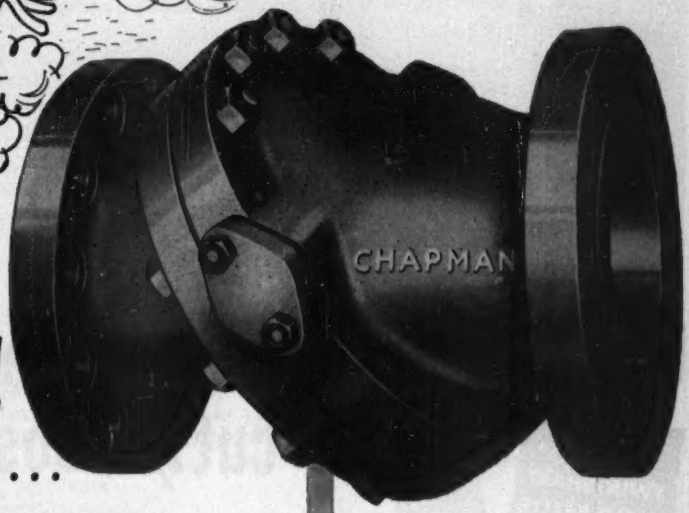
Blaw-Knox Co.—A $1 million office building in Pittsburgh, Pa., for its chemical plants division which operates as part of Blaw-Knox Construction Co., a subsidiary.

Dupont Co. of Mexico—A plant in Tlanepantla, Mexico, to produce a complete line of the parent company's paints and varnishes.

Vickers Inc., Detroit—Additional facilities to meet the specialized hydraulic design needs of West Coast manufacturing plants at its El Segundo Division in Los Angeles.

W. S. Shamban & Co., Culver City, Calif.—An addition that will increase by 300 percent capacity for manufacture of its molded and fabricated aircraft and industrial Kelon fluoroplastic products.

Arabian American Oil Co.—An electrolytic process to be used in its Ras Tanura refinery in Saudi Arabia for regenerating spent alkaline solu-



Complete Seating Contact!

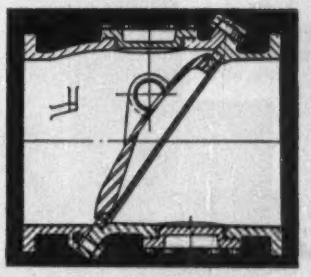
You know you've got it with . . .

CHAPMAN

Exclusive TILTING DISC Check Valve

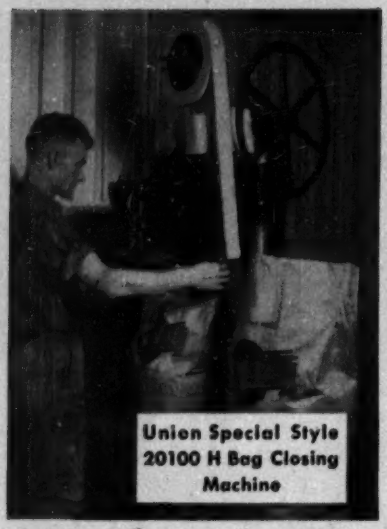
Nothing can "unseat" the disc-ring of this valve from its *drop-tight* contact with the body-ring . . . because clearance at the hinge-pins means that this contact is *complete.* There is no sliding action, consequently no wear, no leakage. And the pivoted disc is cushioned to an easy, silent closing . . . without slam . . . in installations that don't have unusual piping arrangements.

What's more, hydraulic laboratory tests at a top engineering school prove that the specially designed disc and streamlined valve-body reduce head loss as much as 80% under conventional swing-type check valves. See the graphs of these tests . . . and illustrations of the unique construction features of Chapman Tilting Disc Check Valves . . . in Catalog No. 30 (yours for the asking). *Write.*



Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MFG. CO.
INDIAN ORCHARD, MASSACHUSETTS



Here's how to close MULTIWALL PAPER BAGS

FOR lower production costs . . . stronger, neater closures . . . ability to get out rush orders in a hurry, you can't beat Union Special Bag Closing Machines! Specially built to stand up under heavy production schedules, these machines provide the high output rates needed to meet modern competitive conditions.

In the Union Special line, it's easy to find the right unit to meet your requirements. ASK FOR RECOMMENDATIONS.

Ask for a copy of this Bulletin

Get your copy of Bulletin No. 200 containing illustrations and helpful data charts for the complete Union Special line of bag closing machines.

Union Special® MACHINE COMPANY
409 N. FRANKLIN ST., CHICAGO 10, ILLINOIS

Use this heavy duty mixer to cut Your costs

STAINLESS STEEL STEAM JACKETED TWIN-SHAFT MIXER KETTLE

AGITATOR PARTS INSTANTLY REMOVABLE

Fully enclosed motor drives two shafts . . . one with finger-like scrapers to skim kettle walls; the other uses variety of blenders, beaters, mixers. Exceptionally thorough action. GROEN demountable shaft couplings permit removal of entire agitator parts in few seconds for cleaning. Can't disengage in operation. Sanitary. Speeds production. Get all details in Bulletin TAK-2. Also get Bulletin RT-1 describing special high-speed ROTO-THERM JACKET.

Send for BULLETIN TAK-2 TODAY!

GROEN MFG. CO.
4555 W. Armitage Ave., CHICAGO 39, ILL.
30 CHURCH ST NEW YORK 7 (HALF A CENTURY OF FINE KETTLES) 7 FRONT STREET, SAN FRANCISCO 11

INDUSTRIAL NOTES, cont. . .

tion. The process was licensed from the American Development Corp.

John Hewson Co., New York—A Chicago office for service and sales of its high speed static controls and high voltage dc. insulation test instruments.

Aluminum Co. of America—A $3 million fabricating plant in the Lancaster, Pa., area for production of aluminum screw machine products, fasteners, rivets and nails.

Stop-Fire, Inc., Brooklyn, N. Y.—A research laboratory with facilities for expanded study and development of chemical fire extinguishants.

Hilton-Davis Chemical Co.—A 21-ton flushing machine, described as the world's largest unit designed to mix pigments in the production of flushed, or wet, colors for industrial uses. Capable of mixing 1,500 gal. of flushed colors, it has been installed at the company's Cincinnati plant.

Mathieson Chemical Corp., Baltimore—The facilities of the Activated Alum Corp. which it recently acquired. The responsibility for handling the sales of alum products has been delegated to R. J. Quinn, assistant sales manager of Mathieson.

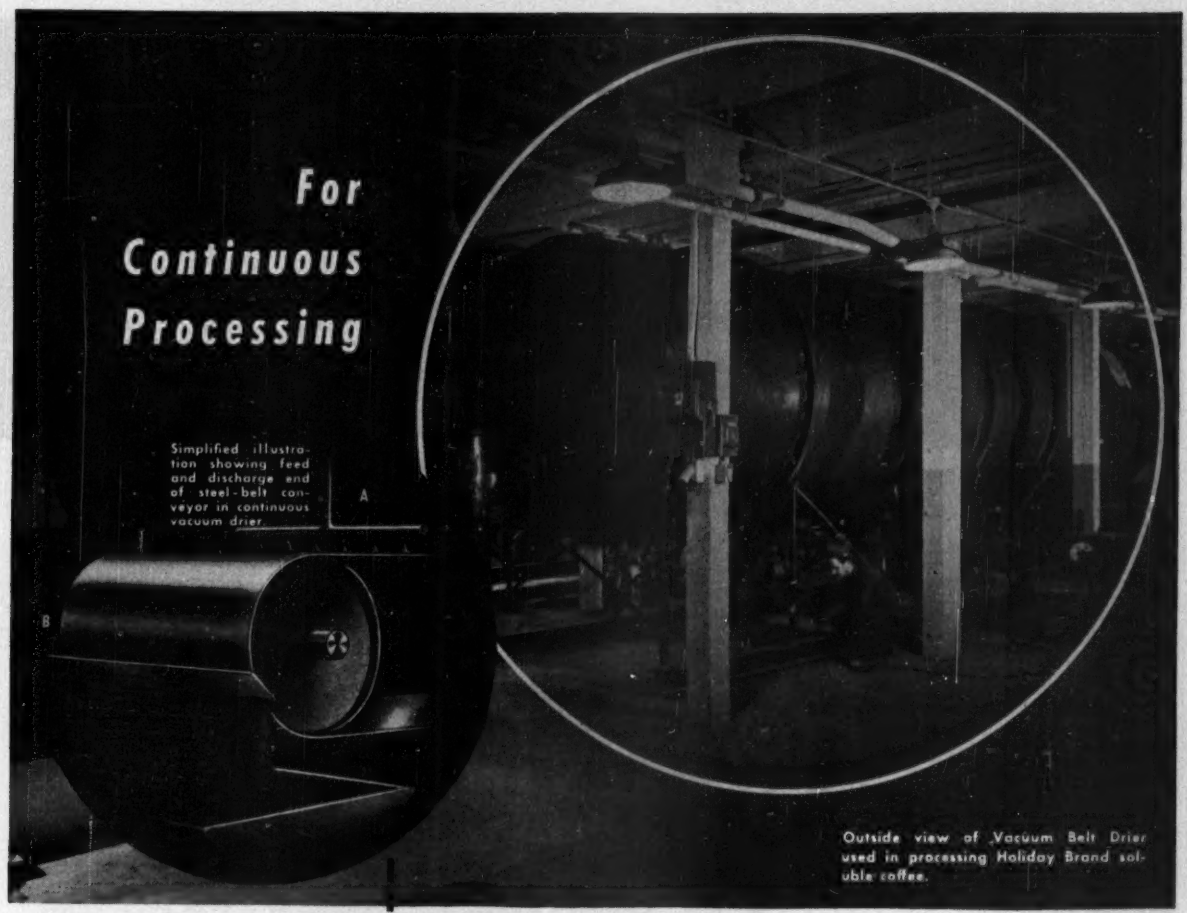
Belco Industrial Equipment Division, Paterson, N. J.—New branch offices in Houston, Tex. Joseph Stoy who has been made branch manager will handle all phases of water treatment.

Permutit Co., New York—A laboratory and pilot plant at its Birmingham, N. J., works which will cost $200,000.

B-I-F Industries, Providence, R. I.—A sales office in Buffalo for its subsidiaries, Builders-Providence, Inc. and Omega Machine Co.

Smoothex, Inc., Cleveland—A new plant to produce organic addition agents which make up the firm's bright nickel-plating method.

—*End*


For
Continuous
Processing
Simplified illustration showing feed and discharge end of steel-belt conveyor in continuous vacuum drier.
A
B
Outside view of Vacuum Belt Drier used in processing Holiday Brand soluble coffee.

THEY DESIGNED A SANDVIK STEEL-BELT CONVEYOR INTO A HIGH VACUUM

Steel Belt Withstands Continuous Scraper Action, Heat and Moisture In This Vacuum Drier

In this application, the special abilities of a Sandvik steel-belt conveyor have opened another door to better processing.

It's been the same story in plant after plant. Whether operating as independent units or integrated into special processing equipment, Sandvik conveyors keep on providing new and better answers to processing problems.

BASIC ADVANTAGES—Sandvik conveyors have a solid band of flat, stainless or carbon steel. This provides a smooth, hard, impervious surface that is easy to keep clean, has a high load capacity and a long service life. It can be fitted with simple discharge devices that scrape material off at any point. It can be used to convey materials through ovens. Belts can be of any length or width.

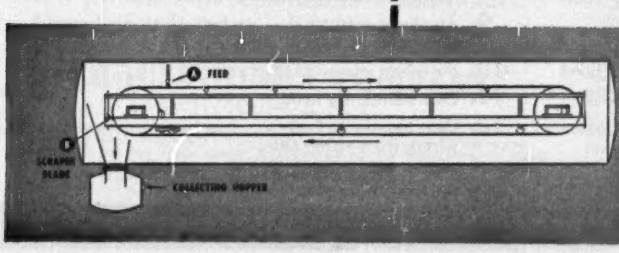
COOLING ARRANGEMENT—Sandvik conveyors can be built with a patented water-bed arrangement which cools from beneath . . . no water gets on top of the band. You can cool and convey, regulate thickness while cooling, cool and strip off gelatinous materials in sheet form, cool loose and pulverized materials, cool solids in sheet form and cool materials in layers.

ENGINEERING HELP—Sandvik's engineering department will be glad to work with you in determining where and how a Sandvik conveyor can improve your processing. Sandvik designs and builds complete conveyors to fit specific jobs.

Write, wire or phone for further information.

SANDVIK STEEL, INC., *Conveyor Division*
111 Eighth Avenue, New York 11, N. Y., WAtkins 9-7180
Manufacturers of Steel Belt Conveyors for Over Thirty Years

SANDVIK
STEEL
BELT
CONVEYORS



Schematic drawing shows how Sandvik conveyor operates in soluble coffee continuous vacuum drier designed and built by National Research Corporation for Holiday Brands, Inc. Concentrated coffee solution is sprayed on belt at point A and solidifies on the band as it travels the entire length of the conveyor and returns to point B. Here a scraper blade removes the crystallized coffee off the band into the collecting hopper.

CROUSE-HINDS EV Series

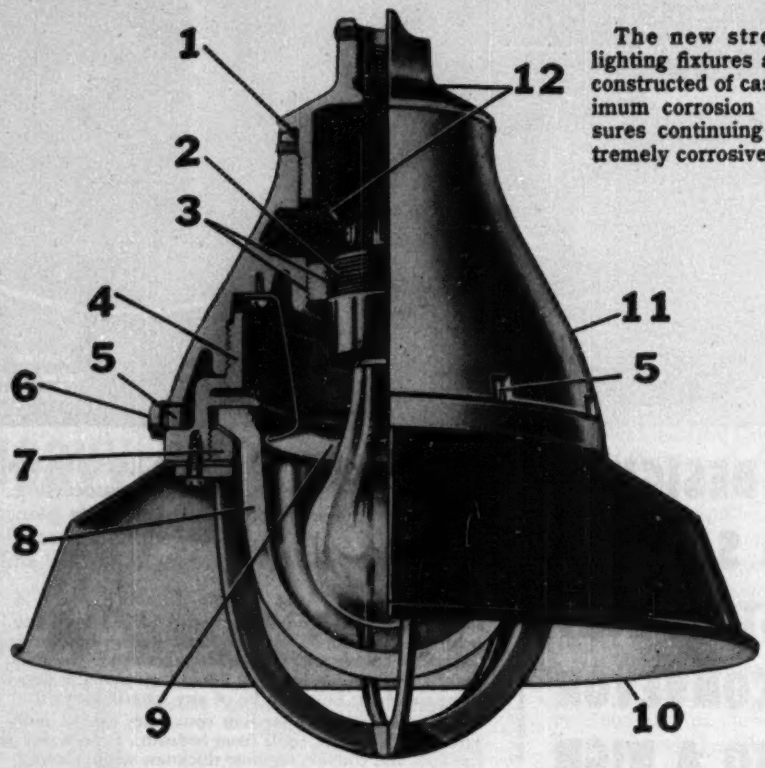
have been redesigned to give you:

EASIEST installation

EASIEST maintenance

HIGHEST efficiency

This adds up to big savings on every installation!

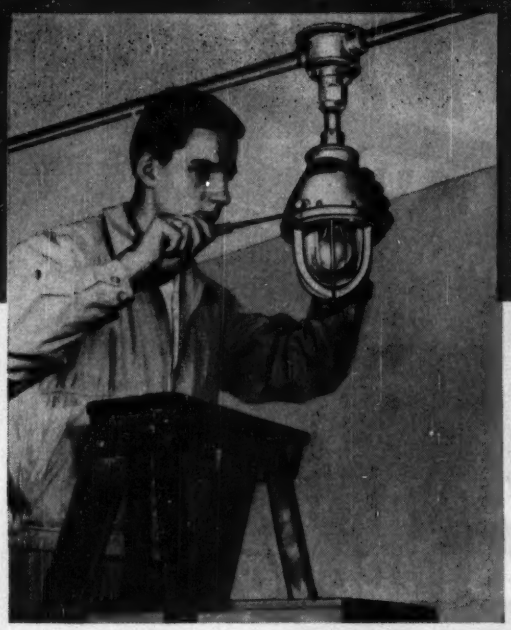


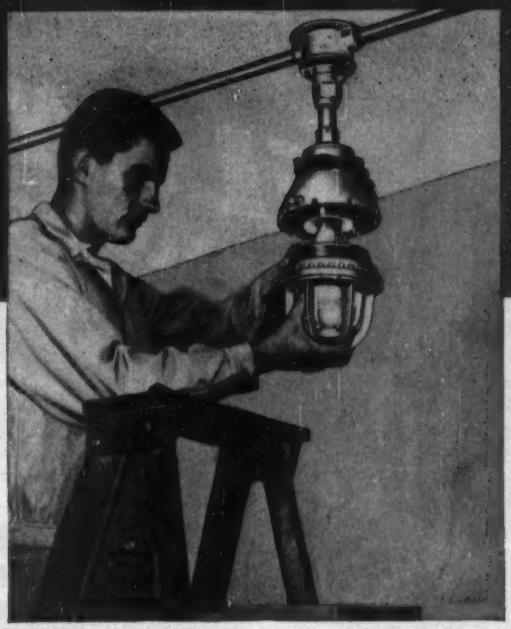
The new streamlined EV lighting fixtures are completely constructed of cast metal. Maximum corrosion resistance insures continuing safety in extremely corrosive locations.

1. Rubber O-ring gasket . . . seals joint against dirt or liquids.
2. New improved shock-absorbing receptacle has "universal" action . . . absorbs shock from *any* direction.
3. Threaded joints are flame tight . . . no sealing compound or external seals are required.
4. Lightweight one-piece assembly of globe, holder, guard and reflector is threaded high up inside of hood . . . no liquid or dirt can enter.
5. Notches in hood and globe holder . . . easy to loosen with a screwdriver.
6. Large knurled thumb screw . . . sets between notches for positive locking.
7. Globe retaining ring and cushioning gasket.
8. Heat and impact resisting globe. The accurately ground flange, essential for safety, is protected in a factory assembled joint . . . never exposed to damage.
9. Auxiliary reflector . . . etched Alzak aluminum . . . eliminates "trapped" light.
10. Porcelain enameled steel reflector.
11. Cast aluminum hood.
12. Cast aluminum body . . . has two openings for easier wiring from either side.

CONDULETS · AIRPORT LIGHTING

Explosion-Proof LIGHTING FIXTURES





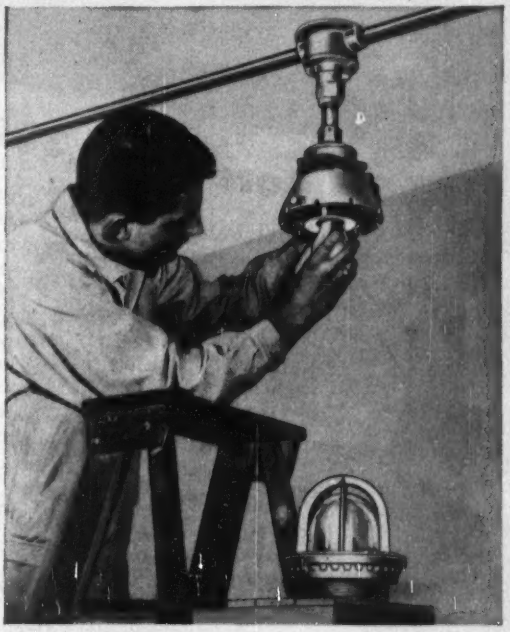
Easiest Relamping—3 Simple Steps

1. Single unit globe-holder assembly threaded into fixture hood is quickly removable for relamping. Slots are provided for prying with a screw-driver when necessary in corrosive atmospheres or other severe conditions. A large knurled thumb screw is easily loosened to unlock the globe and holder.

2. Globe and holder complete with guard (and reflector if used) is removed as an assembly. Only one lightweight piece to handle—globe retained in holder with flame-tight joint fully protected. Explosion-proof integrity assured. The 200/300-watt globe-holder assembly weighs but 8 lbs.

The new design of EV Explosion-Proof Lighting Fixtures is based on exhaustive studies and tests in Crouse-Hinds laboratories. The goal was to produce a fixture that would be easier to install and easier to relamp than any other explosion-proof fixture. Crouse-Hinds designers not only achieved this result but also created a fixture having the highest possible lighting efficiency.

You get 3-way savings when you install Crouse-Hinds EV Lighting Fixtures: quicker installation; quicker relamping; more light. This makes them the best buy for lighting in any location that is hazardous because of the possibility of the presence of flammable atmospheres. Use them on every job and have the best!



3. In relamping only a lamp is carried up and down the ladder and one assembly handled. It is not necessary to stock any spare parts or assemblies for complete convenience.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver Detroit — Houston — Indianapolis — Kansas City — Los Angles — Milwaukee — Minneapolis New Orleans — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle St. Louis — Tulsa — Washington. RESIDENT REPRESENTATIVES: Albany — Atlanta Baltimore — Charlotte — Corpus Christi — Richmond, Va. — Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

TRAFFIC SIGNALS · FLOODLIGHTS

FLOWLINE
WELDING FITTINGS
Stainless Steels, Monel, Nickel
BRING ALL THE ADVANTAGES
OF WELDED CONSTRUCTION
TO USERS OF
CORROSION-RESISTANT PIPING . . .
More than 3000 Stock Items
FLOWLINE Welding Fittings are stocked throughout the country by leading warehouses specializing in corrosion-resistant metals, in Schedules 10, 40, and 80 (Schedule 5 also available)—sizes ½ inch through 12 inches—in stainless steel Types 304, 316, and 347; Monel, Nickel, and Aluminum.
With FLOWLINE Fittings it is practicable for users of corrosion piping to obtain the fullest economy and efficiency of simplified welded construction—in design, installation, operation, and maintenance.
Welded construction provides greatest freedom in designing the layout. The system uses less space, is lighter in weight, and can be assembled and put into service faster. It is permanently leak-proof, has greater strength, longer life, and best flow characteristics.
FLOWLINE corrosion-resistant fittings include tees, stub ends, ells, reducers, and caps. All are made of forged or wrought metals, cold formed by our exclusive process and annealed, putting the metal in the best condition for corrosion service.
WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA
World's Largest Manufacturer of Stainless Welding Fittings

Synthetic greases	Maximum Temperature[1]	Minimum Temperature[2]	Wear[3]	Approximate Cost, $/lb.
Polyester	150° C.	−50° C.	1.8 Mg.	$2.00
High Temperature Silicone	170	−35	Fail	6.50
Silicone-Diester	140	−80	Fail	6.50
Diester	130	−60	0.8	2.00
Polyglycol	115	−35	8.2	1.75
Petroleum greases	115	−30	2.8	0.20

1. Maximum temperature for 1,000 hr. No. 306 ball bearing life.
2. Minimum temperature for 1,000 gm.-cm. torque in No. 204 ball bearing.
3. Navy gear wear, mg./1,000 cycles at 10 lb. load.

Where to Use Synthetic Greases

For normal operating conditions, petroleum greases are better. But for these special conditions many synthetic greases are tops, three GE engineers report.

NOTE: *"All greases made from synthetic fluids have advantages over petroleum products in one or more applications, but they all have weak points too," say Engineers E. R. Booser, A. E. Baker, E. G. Jackson of General Electric Co., Lynn, Mass. Booser, Baker and Jackson, who have been conducting tests on synthetic lubricants, recently pointed out many applications of synthetic greases before the National Lubricating Grease Institute. This QED feature is based on the paper they presented to the Institute.*—EDITOR

Before long, the prediction is, industry will adopt synthetic greases on a broad scale. Much will depend on expected changes in industrial equipment. At the moment though, manufacturers of synthetic greases are banking on their products to sell themselves solely on their performance in present machines and processes. They now claim that the synthetics are particularly adaptable for service under special conditions of temperature and wear.

In the near future, many synthetic greases will go into newly developed high temperature motors, generators and process equipment. They should also find more use in expensive electronic computers and controls where grease cost is negligible. Currently, much synthetic grease is being used in aircraft and military equipment.

Industry, however, will most likely continue to use petroleum greases preponderantly for many years to come. According to Booser, the petroleum greases perform better than synthetic greases under normal mechanical conditions. Cost, in particular, favors the petroleum products.

At High Temperatures . . .

Silicone greases outperform petroleum and other synthetic greases at high temperatures. For reasonably good bearing life, petroleum greases are best for use up to 100 deg. C.; diester, polyalkylene glycol and silicone-diester greases up to 125 deg. C. and the straight silicones up to 150 to 200 deg. C. For short-time operation, it may be possible to use silicones up to about 225 deg. C. with special thickeners such as copper phthalocyanine.

"The silicones would be expected to be particularly useful in bearings which are continuously very hot but in which operation is at low loads, low speeds, or only intermittent in nature," says Booser. *(Continued)*

Principal Synthetic Greases

Silicones are made up of silicon-oxygen chains of various lengths with organic groups attached. Chain length determine the viscosity and volatility, and the attached groups determine the stability and lubricity. Because silicones are poor lubricating agents, other fluids, such as diesters, are sometimes mixed with them to improve their quality. They can be thickened with lithium soaps, silica gel, carbon black, bentonite and phthalocyanines.

Diesters vary even more widely in molecular structure than silicones. They are high molecular weight monomers that can be made out of a variety of acids and alcohols, according to the property desired. In general, high molecular weight and considerable branching of the carbon chain are desired in order to get low volatility and low pour point. Most diester greases use soap thickeners.

Polyethylene glycols are used more as an oil than a grease. At high temperatures they decompose into volatile products that can be blown from a bearing to eliminate sludge formation. They have a wide temperature range (−70 to 120 deg. C.), low rubber swell and with a silica thickener, tend to stick to hot surfaces.

We Look to Tomorrow

With justifiable pride in our past achievements we try to forget them. Complacency is a poor creator, inventor or improver. So while our day-to-day efforts maintain the rigid standards of our products, our day-and-night thoughts are on how we can serve industry better by further developments in our specific chemicals and their derivatives.

OLDBURY

ELECTRO-CHEMICAL COMPANY

Plant and Main Office:
NIAGARA FALLS, NEW YORK

New York Office:
19 RECTOR STREET, NEW YORK 6, N.Y.

BASIC FACTS, MAN-MADE MINERAL

B-400

Electro-Carb (SILICON CARBIDE)

SPECIAL REFRACTORIES

WRITE FOR BULLETIN B-749

Learn THE BASIC FACTS before deciding on type of REFRACTORIES

Because certain types of refractories have been used a long time IS a valid reason for investigating Electro-Carb at this time.

Especially so when Electro-Carb made Refractories, used for heat transfer, for example, showed a measurable 10-times increase in efficiency.

Facts and figures in almost telegraphic brevity are contained in Bulletin B-749. Sent on company-letterhead request. If you have a problem concerning the use of silicon carbide refractories, please submit it at the same time.

Made in our Canadian Plant

Electro SINCE 1919

Electro Refractories & Abrasives Corporation

134 DELAWARE AVENUE · BUFFALO 7 NEW YORK

QED, cont. . .

What's the principal requirement for good high temperature operation? Stability, Booser says. That includes oxidation stability of the soap and structural stability of the grease to give a slow steady bleed of oil into a bearing. While the silicones have a poor lubricity, they do have good stability at high temperatures. On the other hand, above 100 deg. C. polyglycol, petroleum and ester fluids are unstable.

Evaporation also determines the life of a high temperature grease, and again shows why the silicones top the high-temperature field. Between 100 and 125 deg. C., for example, evaporation for all other greases increase sharply. However, at 150 deg. C., a good high temperature petroleum grease has a longer life than most synthetic greases. Excluding the straight silicone, and greases compounded from high viscosity and low volatility polyesters, a good petroleum grease has a mean life about 40 percent longer than the best of the synthetics.

At 150 deg. C. silicone-diester grease has an abnormally high evaporation. It apparently is caused by the volatility of the diester component. Thus the silicone-diester grease is suitable at high temperatures depending probably upon the physical properties of the diester.

Polyalkylene glycol grease also has a high evaporation at 150 deg. C. It is caused by the decomposition of the fluid into volatile products during a rapid oxidation that starts around 125 deg. C. Quite naturally a high viscosity fluid cannot be added to improve this grease.

Bleeding, while important, is not as important a criterion as evaporation in selecting a grease. It is here however that the silicones fall down. Both the silicone lubricants and the polyalkylene

Grease	Torque,* Gm.-Cm. −55° C. Start	−55° C. Run	−73° C. Start	−73° C. Run
Petroleum				
Conventional	42,000	18,000	.....	.....
Low temperature	660	320	.....	.....
Diester				
MIL-G-3278 Lowest	670	230	2,000	2,000
Highest	1,460	330	.....	.....
Copper phthalocyanine	720	120	.....	.....
MIL-L-7421	600	150	1,650	510
G.E. experimental	290	120	700	310
Silicone				
Medium phenyl	21,800	20,900	.....	.....
Low phenyl	630	150	.....	.....
Methyl	110	75	.....	.....
Methyl	.....	.....	75	65
Silicone-diester	150	105	290	140
Glycol-diester	560	270	.....	.....
Alkyl silicate	.....	.....	470	270

* Fully packed No. 204 open ball bearing rotated 1 RPM

Its Properties Rate High with Coatings Manufacturers

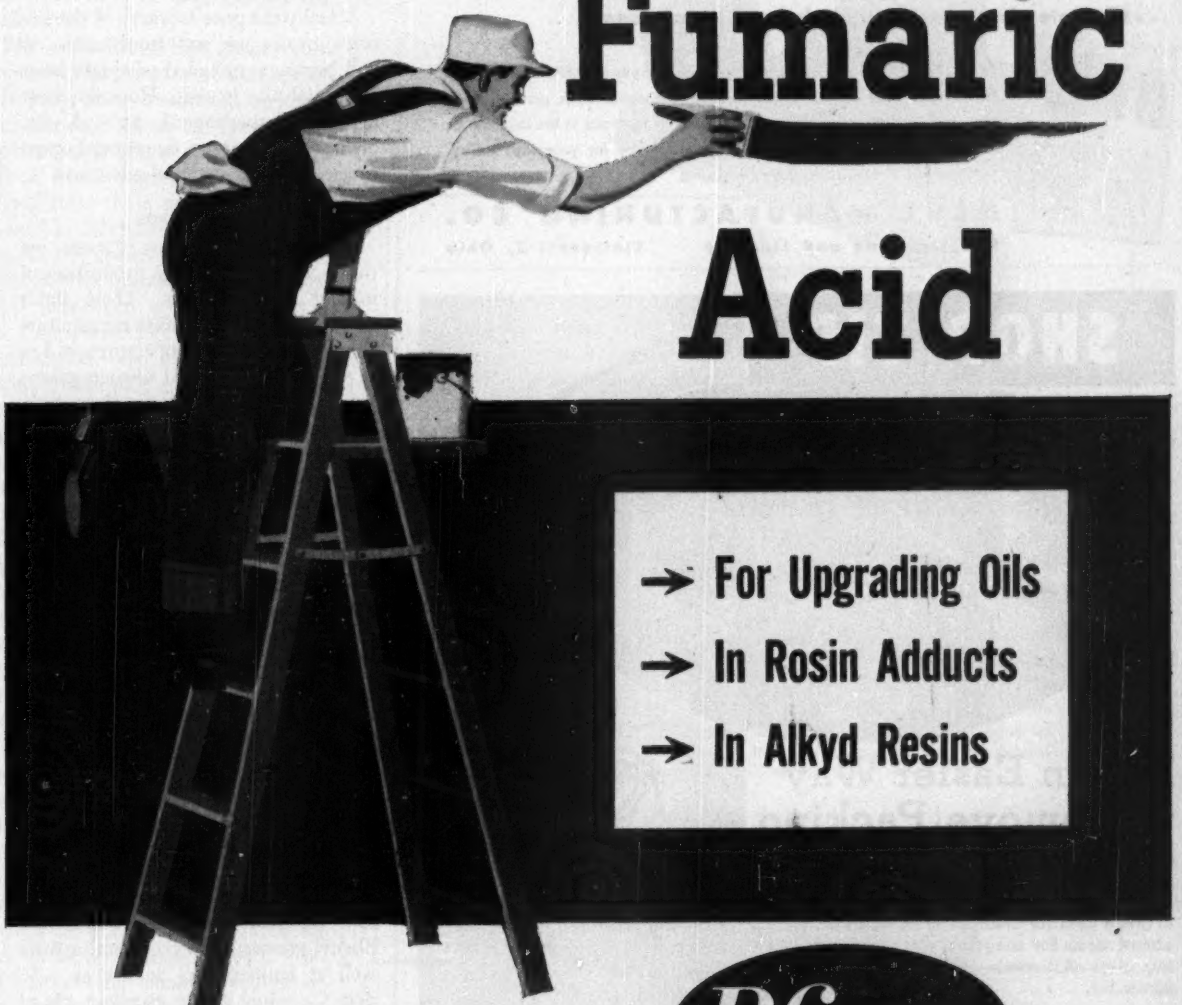
● Pfizer Fumaric Acid is easy to handle because it is free-flowing and non-hygroscopic. It is non-volatile, odorless, non-corroding and non-toxic—actually lower in toxicity than some food acids. These important characteristics are making Pfizer Fumaric Acid the preferred acid in the coatings industry.

Write for samples and additional technical data today!

CHAS. PFIZER & CO., INC.
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.

Pfizer

Fumaric Acid



→ For Upgrading Oils
→ In Rosin Adducts
→ In Alkyd Resins

Manufacturing Chemists for Over 100 Years

Pfizer

NOW!

CIRCULAR BOTTOM

Polyethylene

DRUM LINERS

- ... New low cost
- ... Eliminate stress and strain on liner and seams
- ... Are easier to insert
- ... Eliminate pinch-points and pin-holes
- ... Material easier to get out of the drum
- ... Eliminate mandril
- ... MEHL Liners fit better
- ... Last longer

FREE BOOKLET ... describes uses and advantages of MEHL Polyethylene Plastic Drum and Carton Liners which save container costs, packing costs, tare weight charges, wasted material and salvage costs in the shipment of all sorts of liquids, semi-liquids and solids ... write for your copy today. Also request "Guide to Military Packaging."

MEHL MANUFACTURING CO.

Reading Road and Florence Cincinnati 2, Ohio

SHOP TIP

For an Easier Way to Remove Packing

Here is a rugged hand-tool that "works around corners" for removing old packing from stuffing boxes. The picture shows how a pair of these flexible handled tools operate around obstructions for snagging out those old packing rings. All steel—tempered tool steel corscrew bit.

DURA HOOKS

Ask your jobber—or write for DURA HOOK Bulletin No. DHCE covering sizes and prices.

The PERFECT SEAL

DURAMETALLIC CORPORATION

KALAMAZOO MICHIGAN

QED,*cont.* . .

glycol greases bleed slowly at high temperatures, the diester somewhat higher and the petroleum base greases exceptionally high. Practically all synthetic greases bleed slowly.

Where in Industry—Industry is finding many applications for the silicone greases, particularly those prepared from methyl phenyl silicone oils and lithium soaps. Today it is using them in both sealed and open ball bearings in motors and generators at temperatures above 100 deg. C.

Other uses: High temperature conveyors, where the silicones have greatly relieved maintenance problems with bearings; also controls, instruments and other equipment associated with kilns, furnaces, and heat treating and chemical processes.

Usually the poor lubricity of the silicone greases are not troublesome in ball bearings, provided adequate bearing radial play is used. However, wear in sliding mechanical parts is frequently bad, but can be relieved sometimes by proper material selections.

At Low Temperatures . . .

Best low temperature greases are those containing a large proportion of methyl silicone fluids. These fluids have excellent viscosity-temperature characteristics. At temperatures as low as −75 deg. C. methyl silicone greases have outstanding torque characteristics.

Besides, the methyl silicones, the silicone-diester greases, in which a diester oil is compounded with the silicone oil, also have excellent low temperature properties.

At present, silicone-diesters are available only in limited supply. They are being used right now as lubricants for rubber seals in aircraft hydraulic systems. They are also finding some use as extreme low temperature ball bearing lubricants, but only with low-torque operations. Silicone-diesters, it seems, wear and lubricate at low temperatures as well as silicone greases do at high temperatures.

Contrary to methyl fluids, phenyl fluids generally are not practical for low temperature work. Some low phenyl greases, however, seem to work well at temperatures as low as −55 deg. C., while giving excellent life at temperatures up to 150 deg. C. Medium to high phenyl content allows operation only down to about −35 deg. C., and it usually makes for

shorter life at high temperatures in conventional ball bearings.

Although they are the most commonly used commercial type of synthetic grease, the diester greases, which vary greatly in properties, have not worked out too well for low temperature service. For example, the poorer greases covered by the MIL-G-3278 specification require a considerable break away torque at −55 deg. C. Even the best of this type must be applied sparingly to permit operation of small motors and instruments used in aircraft.

Because of trouble at low temperatures, studies have been made recently to improve diester greases. As a result, new formulations have been made, and a new MIL-L-7421 military specification for a diester grease for use down to −73 deg. C. has been established.

No doubt diester type grease can be improved. At the present time, experiments are being conducted on recent formulations. Many of these experimental greases show good characteristics at low temperatures (see *table*). In addition, these same greases show up well in ball-bearing life tests at 150 deg. C. and in Navy Gear Wear Tests.

Besides the diesters, other synthetic fluids have been used successfully at low temperatures. They include: glycol-diester type oils—some success; silicate fluids—give good low temperature torque, although they may not hydrolyze well; polyester oils—produce greases with low temperature properties intermediate between the diesters and conventional petroleum oils.

Lilthium soap-diesters are useful for both low and high-temperature service, from temperatures of −60 to 130 deg. C. In this range these diesters are good lubricants in addition to being good rust preventatives.

Probably lithium soap-diesters would be used more today if their price was competitive with petroleum products. Right now they are used almost exclusively for aircraft applications, and some are used in refrigeration equipment and equipment for Arctic climates. Occasionally, some of these greases, because of their good lubricity at normal temperatures, are used on sleeve bearings, pivots, gears and instruments operating under severe rubbing conditions.

To Prevent Wear . . .

Diester type greases will reduce wear and surface damage better than other

PROBLEM:

PUMPING CORROSIVE CHEMICALS?

POSITIVE, AUTOMATICALLY-REGULATED FEED?

CONTAMINATION?

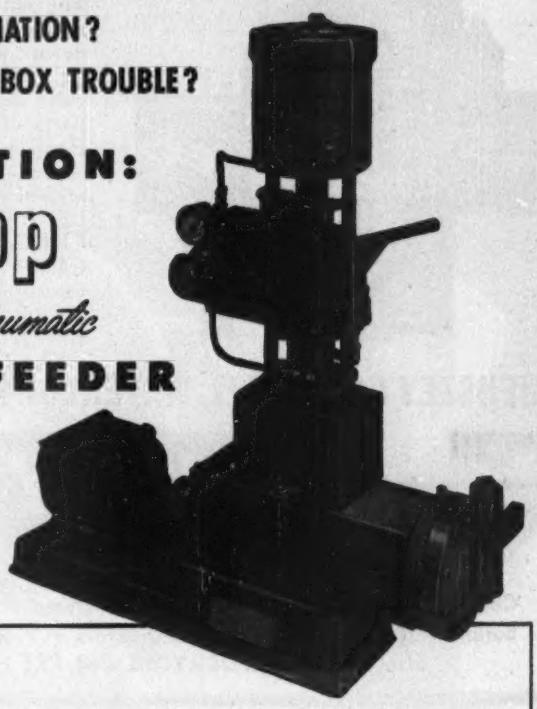
STUFFING BOX TROUBLE?

SOLUTION:

Lapp

Auto-Pneumatic

PULSAFEEDER



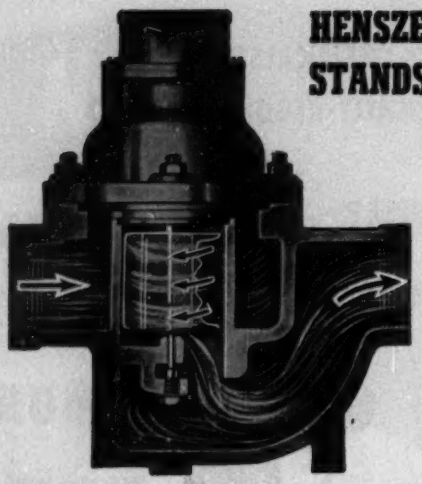
Chemicals successfully being handled include gum and sludge inhibitors, metal deactivators, anti-oxidants, dyes and stabilizers. Also those for boiler water or processing water treatment—concentrated sulphuric acid, sodium sulphite, filter aid slurries, liquid caustic. For the Lapp Pulsafeeder is the positive-displacement pump for controlled-volume pumping of liquids which depends on no stuffing box or running seal—avoids contamination by an hydraulically-balanced diaphragm which isolates pumping mechanism from chemical being handled. Pumps against pressures up to 2,000 lbs., at constant pumping speed—variable flow results from variation only in piston-stroke length. Auto-Pneumatic control uses instrument air pressure responding to any instrument-measurable variable.

GOT A SPECIAL PROBLEM? Every month we hear about applications to which the Lapp Pulsafeeder is the long-awaited answer. A newly-issued bulletin, No. 300, will tell you about our pump and its characteristics, with typical applications and flow charts. A Pulsafeeder Inquiry Data Sheet, on which you can outline your processing requirement, will bring an engineering recommendation. Write us today. Lapp Insulator Co., Inc., Process Equipment Division, 535 Maple Street, Le Roy, N. Y.

Lapp

Auto-Pneumatic

PULSAFEEDER



HENSZEY *Feed Water* **METER STANDS UP** *where others* **FAIL**

The cutting, abrasive action of hot, dirty Boiler Blowdown quickly breaks down meters that depend upon close clearances and intricate parts for their accuracy. Henszey Meters stay accurate —stay on the job—accurately measuring Boiler Blowdown, Feed Water Condensate, FREE-RUNNING CHEMICALS and other "hard-to-measure" liquids. For details consult Sweet's Catalog or write:

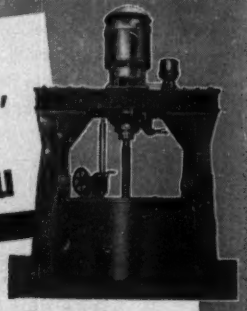
HENSZEY CO., DEPT E2, WATERTOWN, WISCONSIN

HENSZEY

FEED WATER METERS

Continuous Blowdown • Distillation Systems • Heat Exchangers
Boiler Feed Regulators • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

Put *Fletcher* "Know-How" to work for you



Our long Centrifuging Experience can help meet your problems

Fletcher engineers have worked with many of the leading chemical and process firms for years. From that combination has come a large number of very successful installations for Filtering, Separating, Extracting, Dehydrating or Clarifying operations. This same understanding of problems peculiar to these industries is available to you. Let's get together and talk things over.

FLETCHER CENTRIFUGALS

FLETCHER WORKS, 295 GLENWOOD AVE., PHILADELPHIA 40, PA.

QED, *cont. . .*

synthetic greases, and better than petroleum greases. Compared to the other greases tested by Booser (see *cut*), diester greases gave the best results. In fact, none showed more than slight wear after any of the tests.

Silicones, however, were all poor with brass-stainless steel combinations, as were greases containing silicone-diester mixtures or silicate fluids.

Poor results, however, in one material combination should not disqualify a grease. Other combinations are possible, and many are successful. For example, bronze and many varieties of steel can be successfully lubricated by silicone-diester grease. Again, by proper selection of materials, these diesters can be used in various mechanical components, including ball bearings.

The otherwise ideal silicone lubricants do not wear well with some metal combinations, steel against steel for example. In general Booser advises caution. Synthetic greases do have their limitations.

Petroleum greases have a wide lubricity range. Some soft high-bleeding greases give low wear, while some stiff dry products fail early. The best petroleum greases, however, are not as good as polyester and diester greases; but are better than most synthetic greases (see *cut*).

What's ahead for synthetic lubricants? According to Booser, we need lubricants for use at high temperatures, particularly in the range of 200 to 400 deg. C. If we had these lubricants today, many of the present problems in designing gas turbines, aircraft equipment and various electrical devices would disappear. Consequently, the trend may well be toward better high temperature greases.

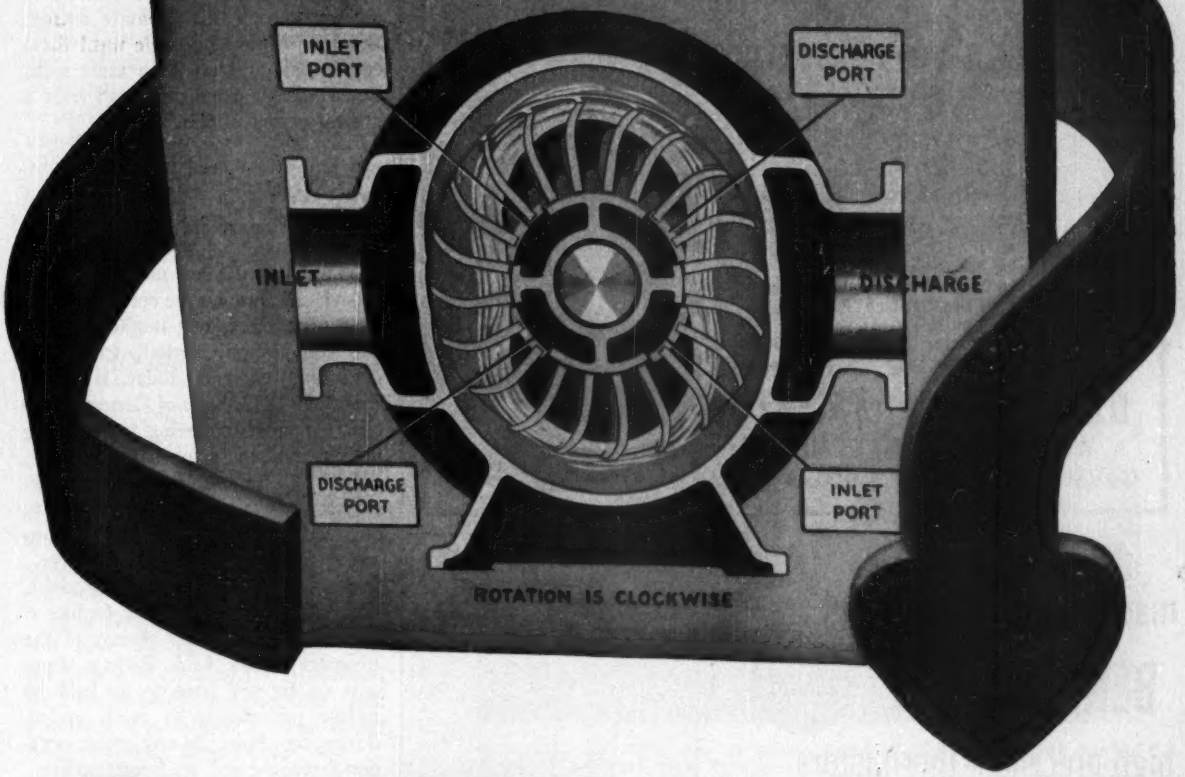
REPORT

. . . Soil Conditioner Puzzle

Some soil conditioners are effective; some are more effective than others. The difference between extremes is great. According to preliminary tests conducted by the Department of Agriculture, costs for successfully treating 100 sq. ft. of the plow layer of soil vary from 50 c. to $7.90, depending on the conditioner used. Per acre costs would range from $200 to $3,000.

Actually, active ingredients in soil

Nash Instrument Air Compressors deliver only clean air, free from oil or dust, and without filters



Here is Why!

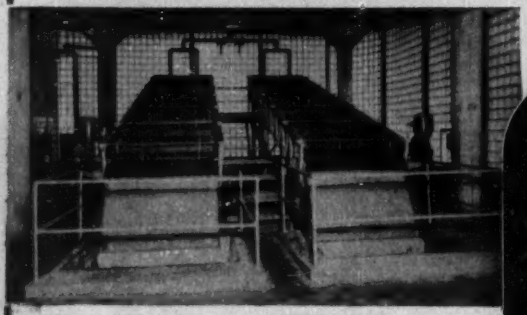
You can dispense with oil filters and dust filters when you install ®Nash® Clean Air Compressors. You can save the cost of maintaining these devices. You can greatly reduce instrument maintenance costs. For the Nash employs no internal lubrication, therefore no troublesome oil is in the delivered air. Moreover, air from a Nash is thoroughly washed and cooled as it passes thru the pump. Dust in the plant atmosphere, even fly ash, is immediately removed.

®Nash® Clean Air Compressors are simple, with only one moving element. No valves, gears, pistons, sliding vanes, or other enemies of long life and constant performance complicate a Nash. No aftercoolers are needed. You will find it profitable to investigate these pumps, now.

- No oil filters.
- No dust filters.
- No internal lubrication to contaminate air handled.
- No internal wearing parts.
- No valves, pistons, or vanes.
- Non-pulsating pressure.
- Original performance constant over a long pump life.
- Low maintenance cost.

NASH ENGINEERING COMPANY
397 WILSON, SO. NORWALK, CONN.

"DAVENPORT"
CONTINUOUS PADDLE
DEWATERING SCREEN



Recovering Waste Pulp

If concentrating the suspended solids is a problem in your process, it would pay you to investigate the Davenport Continuous Inclined Paddle type Dewatering Screen. Write for our complete catalog. For quick reference see "Sweet's 1952 Processing Industries" or "Chemical Engineering Catalog, 1953".

DAVENPORT MACHINE
AND FOUNDRY COMPANY
DAVENPORT 7 IOWA, U.S.A.

DAVENPORT
De watering Presses and Screens.

ROTARY
Steam Tube, Hot Air and Direct Fire Dryers.
Water Tube and Air Coolers.

made right to work right
BENDIX-FRIEZ
high-precision thermistors

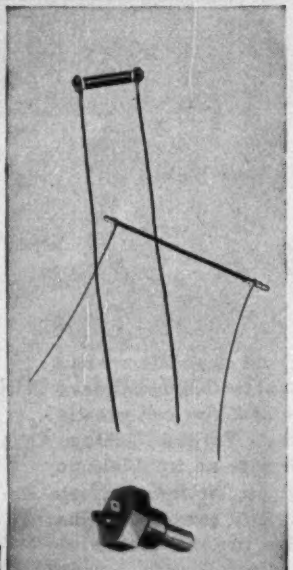
Whether you use these temperature responsive resistors in standard or special models, you can be sure of this. *They'll match your needs* for resistance values, size, temperature coefficient, mountings and quality. Made in our own plant under carefully controlled conditions, Bendix-Friez Thermistors know no equal.

STANDARD TYPES FOR IMMEDIATE DELIVERY

Size (inches)	@ +30°C.	@ 0°C.	@ −30°C.
.140 x .75	45.0 ohms	86 ohms	194 ohms
.040 x 1.5	12,250 ohms	26,200 ohms	65,340 ohms
.018 x 1.5	35,000 ohms	82,290 ohms	229,600 ohms

Write for details.

FRIEZ INSTRUMENT DIVISION of . .
1418 Taylor Avenue, BALTIMORE 4, MARYLAND
Export Sales: Bendix International Division
72 Fifth Avenue, New York 11, N. Y.



Used in this typical application for sensing the temperature of hydraulic oil.

Bendix
AVIATION CORPORATION

QED, cont. . .

conditioners fall into five groups of chemical compounds: polyvinylites, polyacrylites, cellulose derivatives, lignin derivatives and silicates. According to the screening tests made, the amount of active ingredient used in different commercial compounds varies from 15 to 98 percent.

Officials of the Department of Agriculture will not commit themselves any more than this. Definite ratings, they say, cannot be made until these compounds are tested on more soils, under diverse conditions and over a greater period of time.

OPINION

. . . *Trend in Engineering*

Why do we need more engineers today? Because we are currently manufacturing more, one might say, but this would be only partially true. We need more engineers today, says Vice President C. G. Suits of General Electric, because engineering is becoming more complex and specialized.

In 1900, for instance, one engineer sufficed for every 250 employees in industry. Today, U. S. industry requires one engineer for every 60 employees.

Because of growing complexities, the young engineer is now finding it more difficult to keep abreast of the advances in his field. Perhaps from now on he will have to go back to college periodically to catch up on things, says Suits. In any event, occasional reading will no longer suffice.

PREDICTION

. . . *Petroleum Outlook*

Domestic production of crude oil will continue to increase during the next 15 years. At the same time the petroleum industry will be finding oil faster than it will be using it, according to a survey made by John E. Swearingen, general manager of production, Standard Oil Co. (Indiana).

Industry in 1967 will be producing about 8 million barrels of crude oil and 1.1 million barrels of natural-gas liquids per day—a total of about 9.1 million barrels per day. "This is an increase of about 2.2 million barrels per day over present levels, or about 33 percent," he says.

Reserve producing capacity will also go up. Present reserve producing ca-

pacity is about 900 thousand barrels a day. In 1967 it should be about 1.9 million barrels per day.

"Our forecast indicates that, by the end of 1967, cumulative crude-oil discoveries should reach 120 billion barrels, with proved reserves standing at 38 billion barrels—about 13 times the then current rate of production," he adds.

Sources of oil will be developed within the next 15 years in Florida, North Dakota, South Dakota, Louisiana, Mississippi, Texas, Montana, Wyoming, and the California tidelands area. However, total domestic demand for petroleum products by 1967 will jump from 7.0 million barrels to 10.3 million barrels daily. But Swearingen says that the industry feels confident that it can meet these demands.

OPINION

...*Standards Are Helpful*

"My company is a strong believer in procurement standards," says Du Pont's Chief Engineer, Granville M. Read. "Why we are is simply this—since inception of our present standards activity in 1947, for every dollar spent for standards, we saved four dollars net."

Most design engineers and constructors have not integrated their best practices with those of the fabricators. In effect, many organizations lack standards consciousness, says Read. And it's costing them money.

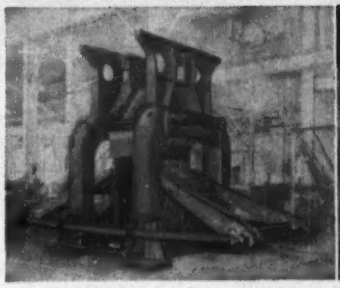
"I do not recommend that we design chemical equipment to specific standards for the sake of using standards, but I do recommend that we use common sense when it comes to applying standards to engineering matters. Let's stop re-discovering America every day."

By setting up standards Du Pont is easing one phase of its technical manpower difficulties. In 1947, Read explains, the shortage of trained engineers began to pinch and the company took steps to improve things.

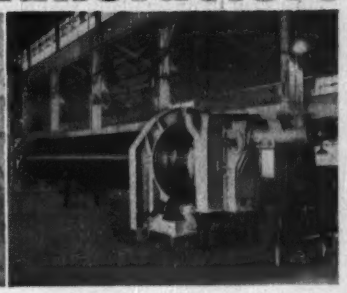
As one approach, Du Pont set up a strong standardization organization. It was called the Standards Committee and was composed of one representative from design, plant engineering, construction, safety, purchasing and a representative from each industrial department and each auxiliary department. Total membership was 21.

This committee, which continues to

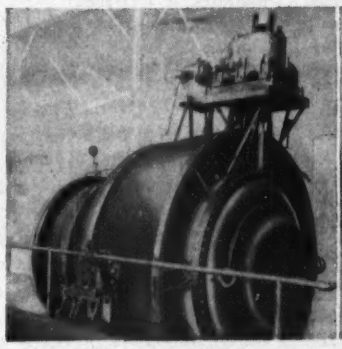
Full Facilities for Contract Manufacture



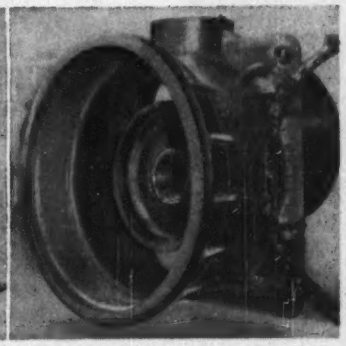
A partial assembly of an 80" High Density Cotton Compress engineered and manufactured by G-B for the trade.



Rotary furnace of cast and fabricated construction. Recently manufactured to customer specification.



96" Hollow Jet Valve, one of three furnished for Hungry Horse Dam, Montana, under government contract.



Cast Steel crusher base recently returned to serve at a fraction of replacement cost by the fabrication, welding and machining of new top section as shown.

IN contract manufacturing every phase of manufacturing and assembling is handled from *start* to *finish* in our own modern plant. In our foundry, one of the largest in the South and one of the few in the Nation using cement molding exclusively, smooth, sound, true-to-pattern castings are produced. Our equally well-equipped fabricating shop with its full complement of equipment for gas, Heliarc, submerged-arc, coated rod and carbon arc welding and our up-to-date machine shop comprise an efficient, well co-ordinated facility.

GOSLIN-BIRMINGHAM
MANUFACTURING CO., INC.
BIRMINGHAM, ALABAMA
CHICAGO: F. M. deBeers and Associates, 20 N. Wacker

operate today, set the policy for the preparation and approval of standards. However, the use of these standards by the personnel was not mandatory. But the company did say that they be given first consideration in any design problem.

"We have experienced very little difficulty in getting the interested parties to accept those standards that have been approved by the standards committee."

The experiment has permitted faster drawing schedules, less revision and substantial reduction in the elapsed time from the conception of a project to its operation. In addition, Du Pont has shown a savings in engineering manpower equivalent to some 7 percent of its total design force.

REPORT

...New Chemical Filter

American Optical Co. and the Pulmosan Co. have designed a new filter to protect industrial workers exposed to poisonous and disease-producing particles smaller than 24 millionths of an inch in diameter, according to a speaker at the recent annual ASME meeting. Chemically treated, this porous felt filter, which is ½ in. thick, is said to be eight times more efficient than other industrial filters of the same thickness.

It protects against arsenic, lead, cadmium and chromium dusts; silica dust responsible for lung disease; and nuisance dusts produced by coal, limestone, iron ore and aluminum operations.

REPORT

... Nation's Brightest People

Nine percent of the most intellectually gifted students in the U. S., according to the Army General Classification Test findings, go into engineering.

The rest divide themselves as follows: 18 percent into natural sciences; 17 percent, education; 14 percent, humanities and arts; 8 percent, social sciences; 7 percent, medicine; 6 percent, psychology; 4 percent, health fields other than medicine; 3 percent, business and commerce; 2 percent, agriculture; and 13 percent all other fields.

How Monsanto finances a project
How it controls production costs
How it figures its profit
How it controls spending
How it keeps its executives informed

Why Monsanto Makes a Profit

NOTE: *At the recent finance conference of the American Management Association in New York City, Daniel M. Sheehan, vice president and comptroller of Monsanto, and seven members of his department gave a full-length portrait of their company's financial operations. This QED feature is a digest of these talks.*—EDITOR

Financing a Project

Monsanto will not start a major project without enough cash on hand to finance plant expansion and additional working capital. This is a company policy. "We do not like bank loans or short-term borrowing," says Comptroller Daniel M. Sheehan. As a rule of thumb, Monsanto tries to have 10 percent of its annual sales as working cash and a reasonable amount of excess cash on hand to take care of any opportunity or emergency.

Before backing a proposed project, a critical review of estimated costs is made. If any project can pass the acid test of return on investment, the board of directors will usually pass on it. The finance committee and the comptroller then determine the time and amount of financing.

To do this, they first have to consider such ponderables as the proper balance between capital stock and debt, which security can best be marketed at the time, and the tax situation.

Last year, for example, Monsanto made money by borrowing money. The company sold $66 million of 3¾ percent income debentures and $38 million of common stock. Under present excess profits tax laws, the total annual cash tax savings amounted to more than a million dollars.

Controlling Production Costs

It is a basic principle at Monsanto that responsibility for each phase of an operation rests with the individual in charge. Therefore, production supervisors are entirely responsible for the over-all efficiency of their operations. However, to assist their charges, Monsanto has set up a variety of standard costs.

According to Comptroller Robert I. Phemister, Phosphate Division, the success of production supervisors at Monsanto "lies in the fact that we are able to furnish these men with complete, accurate and timely cost information."

To figure out its standard costs, Monsanto uses a multiple bracket system. With this system, standard costs are worked up for each Monsanto product at many levels or brackets of output. Normally the top bracket represents capacity production. The other brackets are determined by significant changes in cost. Thus, to get a standard cost at any production level, interpolations between appropriate brackets are easily made.

Actual costs are worked out each month for each production center and service department and measured against the standards. These actual costs include only costs originating in or relating to the immediate plant. In this way, factory costs are not burdened with general expenses.

With the multiple-bracket system, a production supervisor can break variations from standard down into variances resulting from performance, raw materials prices and production volume.

To find out how efficient his operations are, he can figure out his performance variance—the difference between the actual cost of production and performance standard developed for these actual conditions.

To see how effectively he is using plant capacity, he can get his volume variance, which is the difference be-

Baker Platinum Laboratory Ware

Production of platinum laboratory ware has been a specialty of ours for almost three-quarters of a century, and we have devoted a great deal of research and experiment to improving it.

This work has been aided greatly by the fact that we maintain and operate large scientific laboratories and use our own platinum ware in them.

Thus, the ware is subjected to day in, day out tests through use, and practical experience has brought about a number of improvements, among which are:

Improvements in metallurgical processes which have increased its useful life — development of the platinum-rhodium alloy which is now so widely used — design changes like the reinforced rim on crucibles and dishes — development of the low form crucible — improvements in the design of platinum electrodes.

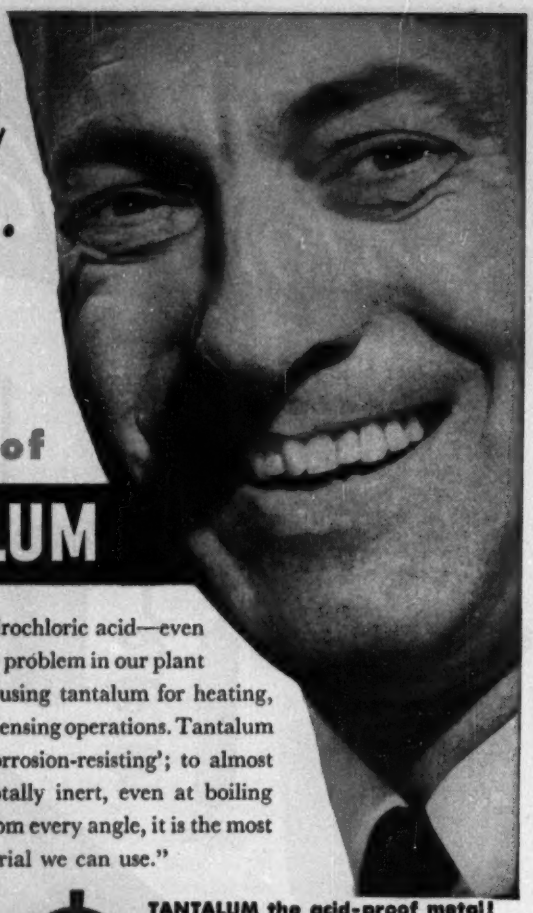
You run no risk in making Baker Platinum Laboratory Ware standard equipment.

BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

NEW YORK **SAN FRANCISCO** **CHICAGO**

"Boiling HNO_3!... just like water with Acid-Proof TANTALUM



"Nitric acid, hydrochloric acid—even aqua regia are no problem in our plant since we started using tantalum for heating, cooling, and condensing operations. Tantalum is not merely 'corrosion-resisting'; to almost all acids, it is totally inert, even at boiling temperatures. From every angle, it is the most economical material we can use."

TANTALUM the acid-proof metal! Tantalum's speed in heat transfer, freedom from thermal shock, and acid-proof properties add up to equipment that increases production, saves time and space, saves maintenance, saves shutdown time, and eliminates product contamination due to corroded equipment.

Use TANTALUM With Economy for most acid solutions, corrosive gases or vapors; not with HF, alkalis, substances containing free SO_3.

Tantalum Steam Coil. Additional heating capacity obtained by building coil on large steel flange protected by tantalum tube sheet, eliminating risers. Connections are at bottom.

Write for the Fansteel booklet, "Tantalum Acid-Proof Chemical Equipment", and consult Fansteel for designs and recommendations.

TANTALUM the most nearly perfect material of construction

Acid-Proof TANTALUM

22402

Fansteel Metallurgical Corporation NORTH CHICAGO, ILLINOIS, U.S.A.

QED, cont. . .

tween the actual volume of production and the volume of capacity operations.

He may also determine the differences between actual and standard raw materials prices. However, unlike the other variances, he cannot control this one. Therefore, responsibility here passes over to management.

Figuring Its Profit

What's the best yardstick in figuring net income? According to Assistant Comptroller Earl J. Wipfler, it is your return on investment. Monsanto defines return on investment as the relationship between the money you take in and the money you invest in a specific activity during a set period of time, usually a fiscal period. The money you take in of course is the money after taxes.

This yardstick is much better than the yardstick of return on net worth. Why? "Because a company may change its fiscal program, establish or reverse special reserves, or revise depreciation policies. Such changes have no effect on Monsanto's concept of investment," says Wipfler.

By investment, Monsanto means gross assets less these deductions: current liabilities, reserve for pensions, employee bonus, minority interest of subsidiary companies, large cash and securities balance in excess of normal requirements and the cost of fixed assets for major projects that have not started up. One thing not deducted is the reserve for depreciation, which is really money needed to keep the original investment going.

The yardstick is also used to figure the return throughout the company—on over-all operations, each division and subsidiary operations, individual products and proposed projects including new and expanding facilities.

One of the best uses, according to Wipfler, is in evaluating requests for appropriations that call for new fixed capital. Over-all finding: Actual returns are usually as much or more than the estimates made at the time of the request.

Controlling Its Spending

To know where it stands financially, Monsanto directors depend on a bevy of up-to-the-minute reports on what earnings and expenses will be a year or two from now. With this news, they can then intelligently and leisurely plan away.

Forecasts, covering a period of 24 months in advance, are prepared each month in detail by people responsible for particular operations. These forecasts are then translated in terms of cash and sent on to the board of directors. For long-range planning, forecasts are made at times for two years in advance.

Besides a series of individual forecasts, which cover every phase of company operations, the board receives from divisional general managers a summary of expected earnings. These figures would include estimated earnings from proposed expansion of plant facilities.

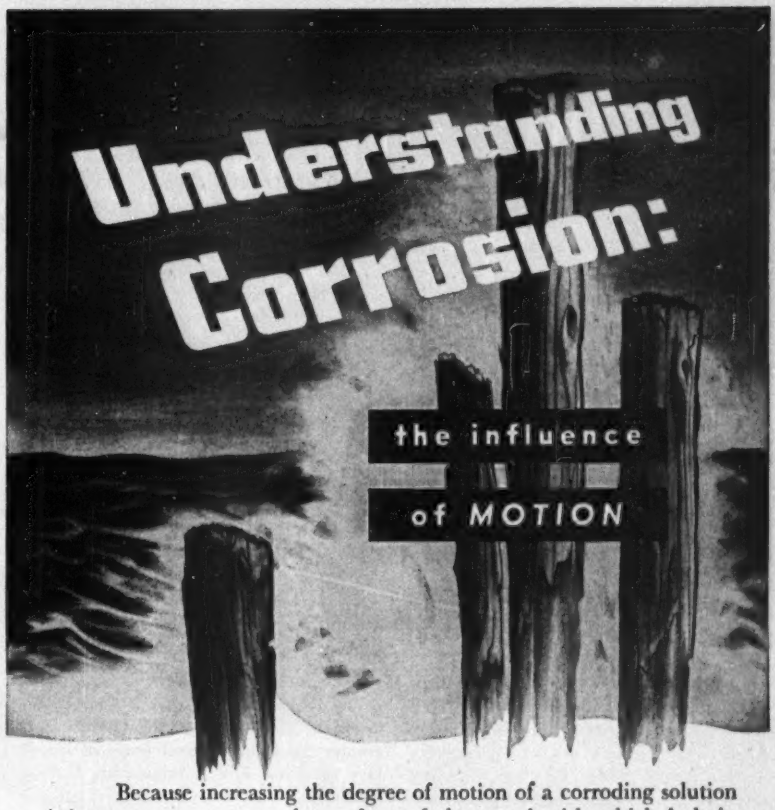
Estimated disbursements come next. They include expenditures for construction, working capital needed to finance new facilities, funds for associated companies, expected dividends based on existing rates and federal income taxes.

Now when the final statement is in, the directors are ready for action. Say disbursements are higher than the anticipated income, as they were in the forecast of September 1950, then the directors know immediately that additional financing is needed.

"Without such a forecast in 1950, the need for additional funds would have become apparent eventually, but it is unlikely that the requirements could have been estimated accurately either as to time or amount. Financial planning under these conditions would have been reduced to expediency, which is both risky and expensive," says Comptroller Phemister.

To make sure its plans are carried out, Monsanto has set up tight control within the organization. Because of its far-flung operations, compliance with policy and consistency in methods, officials claim, are doubly important.

To assure control, Monsanto has set up an internal auditing program. Included in it is an internal auditing staff that has three principal functions: (1) Periodic surveys of internal control, initially by questionnaire and then, if necessary, audits of various kinds; (2) scheduled audits: in some cases tests, in other instances detailed checking of transactions—scheduled when the survey of internal control says they are needed; and (3) special assignments, such as how the company is complying with government regulations, preparation of accounting annuals, review of procedures in auditing government contracts and develop-



Because increasing the degree of motion of a corroding solution brings more oxygen to the surface of the metal with which it is in contact, such increase has a decided influence on the rate of corrosion. In liquid that may appear quiet, convection currents are nonetheless at work slowly distributing dissolved oxygen throughout the solution. When velocity agitates the liquid-air interface, unsaturated liquid is brought to the surface layer and the oxygen-solution rate rapidly stepped up. At the same time the liquid film on the surface of the metal is thinned so that this increased amount of dissolved oxygen diffuses more readily. Thus the combined effect of more dissolved oxygen conveyed more rapidly to the metal is a marked acceleration of corrosion.

Velocity, too, is often the indirect if not the direct cause of mechanical erosion of metal, for the deterioration it helps bring about results in the formation of corrosion products. In a quiet system these might serve a protective function but with motion a factor they erode readily, leaving already weakened metal exposed to further corrosive attack.

The ever-varied interplay of its many governing factors render the mechanism of corrosion complex indeed. Recognizing effects, determining causes, and controlling those that can neither be eliminated nor regulated is a responsibility industry has long assigned to Dampney. The reduction of *your* corrosion problems through the medium of Dampney equipment-engineered protective coatings . . . formulations of vinyls, ceramics, asphaltums, silicones, chlorinated rubber and other natural and synthetic resins . . . is a responsibility we should likewise welcome.

MAINTENANCE FOR METAL

THE DAMPNEY COMPANY

153-1 HYDE PARK, BOSTON 36, MASSACHUSETTS

Ansul Extinguishers have put out thousands of "hot shows" in flammable liquid, gas and electrical fires. Fire-fighters using Ansul Extinguishers are cool customers on two counts. First, the heat shielding screen of dry chemical protects them from the radiant heat of the fire. And, second, actual experience has given them confidence in the safety, dependability and greater fire-killing effectiveness of Ansul Dry Chemical Fire Extinguishing Equipment.

SEE PAGE 124

SAVINGS FLOW FROM SPEED-LAY PIPE SYSTEM

EVERYTHING FOR A COMPLETE PORTABLE PIPE SYSTEM

FACTORY PACKAGED
PIPE COUPLINGS—FITTINGS
VALVES—ACCESSORIES
LIGHTWEIGHT, LABOR SAVING

immediate installation

by one unskilled man. 2½ to 30 o. d. black or galvanized. Ready to lay—without delay.

Complete inventory of all Industrial Pipe, Valves, Fittings, and Flanges.

DELIVERED READY FOR INSTALLATION

SPECIALISTS IN PREFABRICATED PIPING

ALBERT
PIPE SUPPLY CO., INC.
Berry at North 13th St.
Brooklyn 11, N. Y.
Phone EVergreen 7-8100

SEND COUPON NOW!
ALBERT PIPE SUPPLY CO., INC.
Berry at N. 13th St., Brooklyn 11, N. Y.
Please send free booklet describing your Speed-Lay System and services:

NAME .....
FIRM NAME .....
ADDRESS .....
CITY ..... STATE .....

ment of procedures for controlling major construction projects.

Informing the Execs

To keep its executives informed, Monsanto relies heavily on reports and charts. Reports are prepared for the company as a whole, for each division and for each product. The board of directors receives: (1) a condensed summary of the balance sheet and statement of income, (2) reports covering return on investment, the rate of plant operations, estimated cash position, and net sales and net income by divisions and by subsidiary.

With these facts in hand, management can judge appropriately. Typical decisions: Which product should be pushed because of high budget margins. Which might require attention along cost reduction lines.

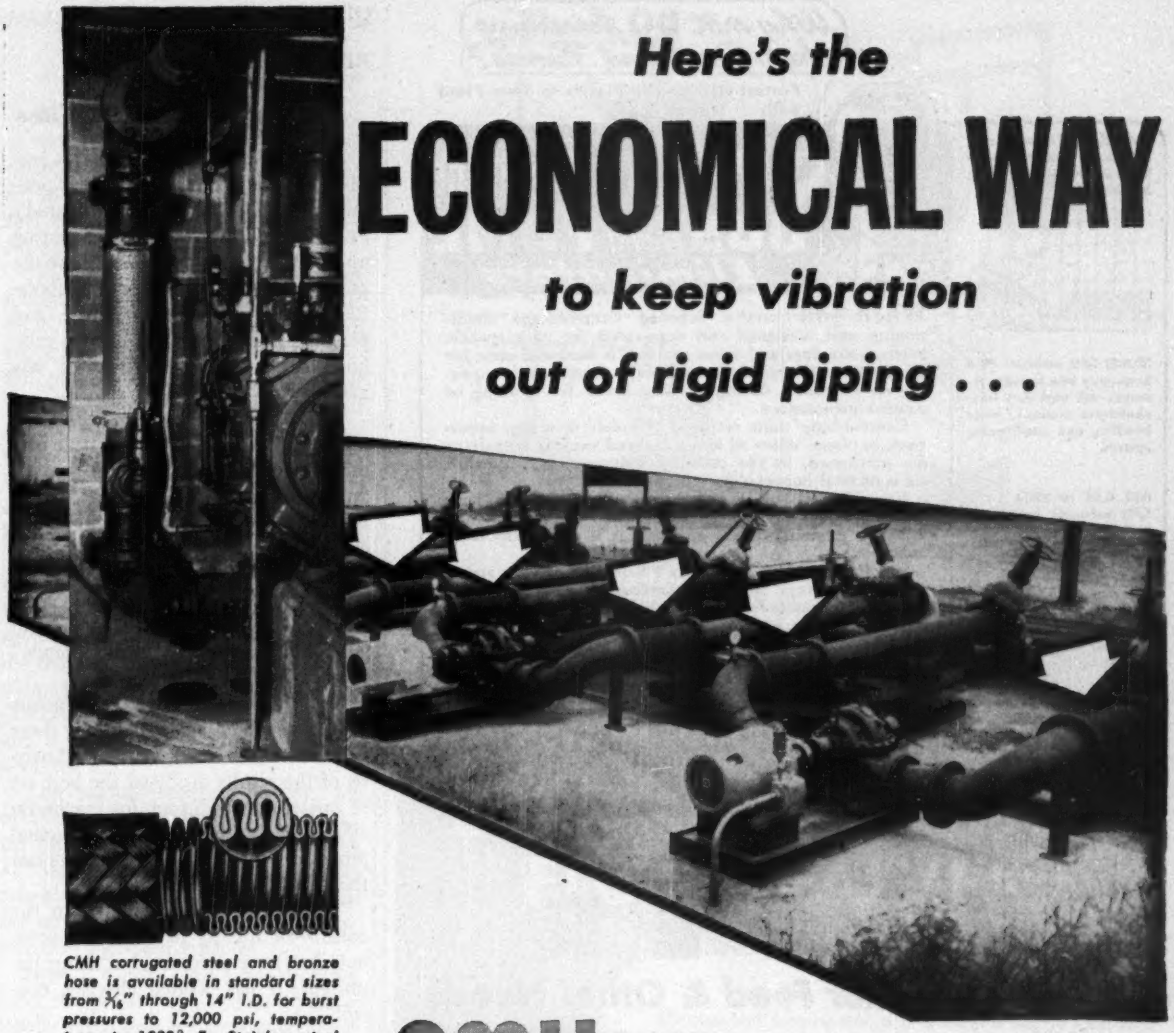
For presenting operating information, Monsanto depends chiefly on charts and graphs. In fact, it has substantially expanded its use of graphic devices. According to Comptroller, M. C. Covert, Organics Chemicals Division, properly prepared charts present cost data and financial facts clearly and concisely, and save an executive considerable time. In addition, they point up changes and trends. Monsanto now prepares several hundred charts, some monthly, others quarterly and annually.

The three levels of management at Monsanto—board of directors, executive committee and general managers—each has its own chart series, covering its sphere of responsibility. Data and charts are designed like pyramids—running from the general to the specific.

To speed the preparation of reports, Monsanto has adopted electronic business machines. All monthly financial reports are prepared on an IBM card programed calculator. As a result, reports that formerly took 40 man-days to prepare now are produced in 8 hours.

Within a year or so, Monsanto expects to use electronic equipment to prepare cost reports by product departments. The work of some 200 man-days will also be cut to a few hours. The company eventually looks forward to all-electronic accounting. This will help out Monsanto executives by giving him more up-to-date information and allow the accountant to devote more time to assisting management.

(continued)



Here's the

ECONOMICAL WAY

to keep vibration out of rigid piping . . .

CMH corrugated steel and bronze hose is available in standard sizes from 3/16" through 14" I.D. for burst pressures to 12,000 psi, temperatures to 1000° F. Stainless steel types also available.

CMH convoluted hose is available for lower pressure applications in a variety of types including square locked, ball bearing and fully interlocked . . . in steel, bronze and other alloys. Sizes up to 12" I.D.

CMH FLEXIBLE METAL HOSE

Isolation of vibration is easy and economical when you use CMH Metal Hose to connect rigid piping to machinery. Metal hose assemblies are quickly installed, just like a length of pipe. The flexibility of the unit effectively absorbs vibration while the all-metal construction assures long, dependable service. If you have a vibration problem in your piping it will pay you to consider CMH Flexible Metal Hose. Your Flexonics distributor can give you full information. Look for his name in your classified telephone directory.

CHICAGO METAL HOSE Division

Flexonics *Corporation*

1317 S. Third Avenue • Maywood, Illinois

Manufacturers of Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexon identifies CMH products that have served industry for over 50 years.

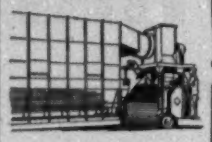
CMH

Why not DO Something about Dust and Fumes?

Protect Health and Profits in Your Plant with

Schmieg CENTRI MERGE DUST and FUME Eliminators

Available in capacities to handle air cleaning jobs—large or small—singly or in batteries.



30,000 CFM arrestor—in a large grey iron foundry removes dirt and dust from shake-out stations, sand handling and conditioning system.

400 CFM to 2500 CFM exhausts dust and fumes from isolated grinding or buffing jocks—self-contained, complete with fan motor and drive.

THE Sand AIR PURGE in CENTRI MERGE

When you have a Schmieg Centri-Merge conditioning unit, designed and engineered for your specific needs, your dust and fume problem is banished once for all. Because Centri-Merge is always dependable, requiring no shutdown during working hours for cleaning or routine maintenance.

Centri-Merge units are used in widely divergent industries, in plants where all kinds of metal working operations are performed, in the chemical industry where purified air is of vital importance.

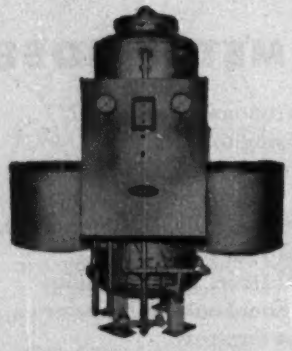
Centri-Merge operates on a simple principle. It collects pollution in the air, carries it along on a swirling cascade of water to an underwater trap where it is easily disposable as sludge.

Simple installation to occupy a minimum of floor space, maximum savings in low maintenance costs, assurance of years of trouble-free operation, in many cases a reduction in heating expense where re-circulation of air is possible. You can't buy better air cleaning equipment.

Do something about dust and fumes in your plant. Call in Schmieg engineers to develop a unit ideally suited to your needs. Do it today.

Schmieg INDUSTRIES INC.
Engineers & Manufacturers
P. O. BOX 4701 • DETROIT 34, MICHIGAN

HIGH PURITY
WATER
For Process, Boiler Feed & Other Needs



COMPLETELY AUTOMATICALLY*

Operating on the most efficient deionizing technique known (intimately mixed cation and anion exchangers in a single unit tank), raw water passes through a Penfield Automatic Mono-Column Demineralizer only once — *yet comes out with resistance reported as high as 20,000,000 ohms.* No heat or steam power is ever required and there are no valves to operate. Even regeneration is accomplished completely automatically by the simple flip of a single switch.

*The new Penfield Mono-Column Demineralizer pictured above performs all its operating functions completely automatically — even recuts in effluent when proper pre-set purity is reached after automatic regeneration. Write for full information on units of any desired capacity up to 10,000 gph.

RUBBER-LINED, SARAN-LINED & NICKEL TANKS
Specially fabricated to suit your individual requirements by Penfield's Tank Fabricating and Lining Division. Write today for complete details.

PENFIELD MANUFACTURING CO., INC. 19 High School Ave. Meriden, Conn.

FILTERS SOFTENERS Penfield "Planned Purity" PAYS! DEGASIFIERS DEMINERALIZERS

QED, cont. . .

REPORT

. . . Cuts Pilot-Plant Time

By using statistical analysis, it is possible to take short-cuts during experimentation. Consider, says Cyanamid's *For Instance*, the problem of setting up a new chemical process. Assume the product has been made in the laboratory, at a certain temperature and pressure, in a given time, using a catalyst and a known mixture of raw materials.

What are the best conditions for pilot plant operation and full scale production? "Without statistical analysis an answer might be obtained from 100 to 150 experiments in each of which only one of the factors (temperature, pressure, time, catalyst and raw material mixture) would be changed. With statistical analysis an excellent answer was obtained from 32 experiments," Cyanamid reports.

Key combinations of the factors were determined first. Then only these selected combinations were run. Analysis of the results disclosed the best set of operating conditions for maximum efficiency during startup and actual processing, while taking into account the quality of the product.

"Statistical analysis applied to the control of quality in industrial products has lowered costs, but more important, it has assured effective control."

According to Cyanamid, it does not require expert mathematicians to apply statistical methods. The fundamental concepts have been reduced to practical terms and made available in a number of books during the past few years.

A word of caution, however: Statistics will not reduce the need for experience and clear thinking. Human ingenuity and mental alertness still are essential for success, but the statistical approach assures the best organization of effort so that maximum benefit is derived from it.

Cyanamid's case, and others like it, may be technical signs in our times. Possibly, a new branch of engineering is in the making. It could be called operations engineering and based on the mathematical techniques worked out by the latest of the research sciences — operations research (see *Chemical Engineering*, Oct. 1952, p. 238).

DESCRIPTION

. . . *Latest Atomic Reactor*

The Experimental Breeder Reactor at the Argonne National Laboratory, called the most advanced power reactor in operation today, produces more fuel than it burns and gives off useful energy at the same time.

Although it generates significant quantities of electricity, the EBR was built primarily to demonstrate and study the possibilities of breeding—the process of producing more fuel than is burned. Recent advances in reactor technology indicate that this process is possible. Now AEC wants to know how much fuel can be produced in excess of the quantity of fuel burned.

Construction Details—According to recent unclassified data, the reactor core is about the size of a regulation football. Liquid sodium-potassium alloy removes heat energy from the machine and leaves the system at 350 to 625 deg. C. Heat from the alloy generates a super-heated steam of 400 psi. pressure.

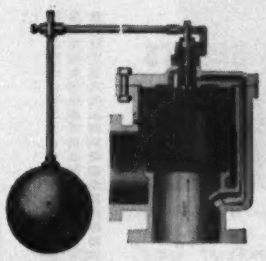
The reactor requires 85 kw. for operation. Power density is 250 kw. per liter and the neutron flux is about 10^{14} neutrons per sq. cm. per sec. Excess electrical power is used for building service or dissipated to the atmosphere by electrical heaters.

How It's Put Together—Working from the inside out—surrounding the small central core is a breeding blanket of natural uranium, U^{238} isotope. The blanket absorbs neutrons from the core to produce plutonium fuel. Holding the blanket and fuel is a cylindrical tank containing a sodium-potassium coolant.

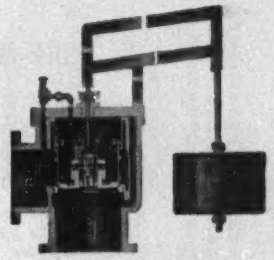
Surrounding this tank is a reflector that turns back electrons escaping from the reactor. Surrounding the reflector is a shield of lead and concrete that absorb the radiation given off in the fission process. To prevent reactor runaway and to control chain reaction, designers have installed unique mechanical and nuclear devices in the core and blanket.

Cooling System—Sodium-potassium alloy was chosen as the collant because of its low melting point, high boiling point, high specific heat, non-moderating properties and because its corrosive nature is modest compared to other metals.

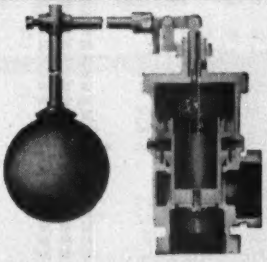
From a storage tank above the reactor, the coolant flows through the reac-



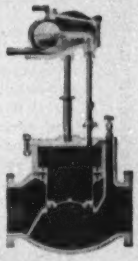
Sizes 3" to 36", cold water, full open or tight closed action, inlet pressure 20 psi-250 psi.



Sizes 2" to 36", cold and hot water, low or high pressure, throttling design.



Sizes ½" to 2", cold water, all bronze snap action, pressure 20 psi to 175 psi.



Sizes 3" to 36", cold or hot water, pressure 20 psi.-250 psi.

For dependable high and low-pressure water level control

Install GOLDEN-ANDERSON *"Cushioned"* FLOAT VALVES

Illustrated above are a few of the many Golden-Anderson float operated control valves designed for either cold or hot water, open or closed tank service in reservoirs, tanks, coagulating basins, mixing chambers, etc. These valves may be of either the quick-opening or throttling design with integral or remote pilot control—available in angle or globe body pattern. This special air and water cushioning feature prevents any chatter or bang in operation.

Write for our engineering bulletins. They will interest you!

GOLDEN ANDERSON Valve Specialty Company

2099 KEENAN BUILDING ★ PITTSBURGH 22, PA.

IN WIRE-MESH PRODUCTS

LET JELLIFF DO IT!

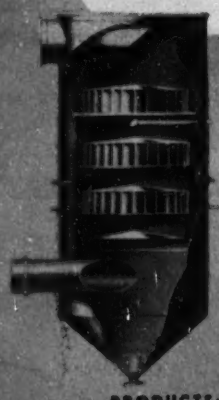
For 72 years we've been weaving Wire Mesh. And a good part of that time we have also been making things of Wire Mesh for people who find it is cheaper, easier and generally more satisfactory to "let Jelliff do it."

From big Dipping Baskets to tiny precision filters — from fuel strainers to what-is-it gadgets — JELLIFF'S Custom Production Department turns out fabricated Wire-Mesh products at speed, price and precision that mean lower costs and a stronger competitive position for our many customers.

If you buy or make wire-mesh assemblies as components of your own products and have not yet had an estimate from Jelliff, write today for details. No obligation, even if you enclose a blueprint for us to figure on. Address Department 15.

THE C. O. JELLIFF MFG. CORP.
SOUTHPORT CONNECTICUT

DUST
FUMES
VAPORS
OR GASES
EFFICIENTLY CONTROLLED BY
MULTI-WASH
MULTIPLIES WASHING FOR TOP EFFICIENCY



Only Schneible Multi-Wash collectors can give you the benefit of extra washing action that assures maximum removal of all contaminating material.

You can be sure of top efficiency with a minimum of up-keep because the Multi-Wash principle employs no moving parts or nozzles that can wear or clog.

Multi-Wash collectors installed 15 years ago are still operating which proves the Schneible principle gives lasting performance.

Write for bulletin 551 or contact your local Schneible representative.

CLAUDE B. SCHNEIBLE COMPANY
P.O. Box 81, North End Station
Detroit 2, Michigan

PRODUCTS:
Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Free-Hanging Hoods • Water Curtain Cupola Collectors • Ductcraft • Volocyclone • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

SCHNEIBLE

QED, cont. . .

tor by gravity. Electromagnetic pumps then send it through a primary heat exchanger and back up to the storage tank.

In flowing through the reactor, the coolant becomes radioactive. Therefore, the entire primary coolant system must be shielded.

Because of this, a secondary coolant system had to be set up. In the secondary system, sodium-potassium coolant removes the heat from the shielded heat exchanger. This coolant is not radioactive since it does not flow through the reactor. In the secondary heat exchanger, steam is produced and later flows through a 250 kw. turbogenerator system to produce the electricity.

OBSERVATION

. . . Math and Intuition

Not all problems in industrial research lend themselves to mathematical solution. Some yield to experimental methods pure and simple.

In designing automotive engine components, Researcher Arvid E. Roach of General Motors explains, it is often less expensive to make the component and put it through tests until it breaks down. The part can be redesigned and retested many times until it shows a maximum strength with a minimum of material. You could get the same results mathematically, but it would probably be vastly more difficult and time consuming.

Perhaps we are overplaying the role of math in design operations. Indeed, says Roach, it is surprising how often designs that were based only on the designer's intuition are found by analysis to be mathematically sound. The archery bow, for example, is the classic development of a mathematically perfect form.

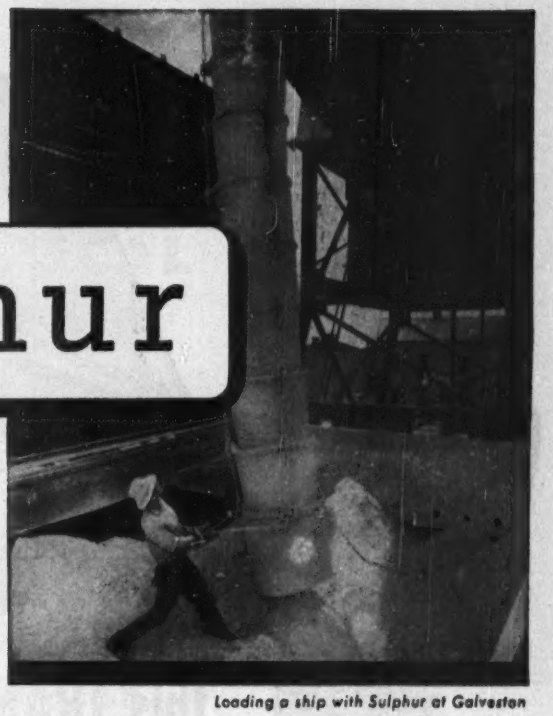
OPINION

. . . Operations Research

Are any of your departmental goals out of line with over-all company goals? According to Alfred N. Watson, Arthur D. Little, Inc., operations research can answer this question for you, and do it scientifically.

Simply, operations research applies the methods of scientific research to operating problems outside the con-

Sulphur

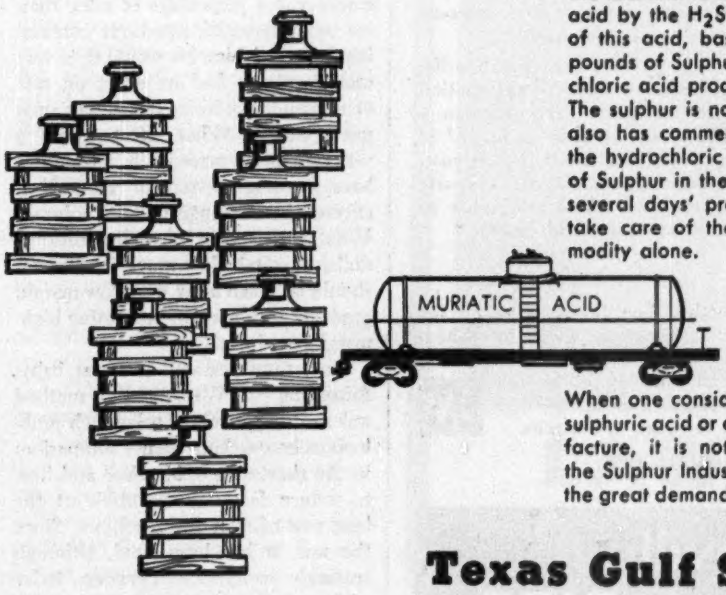


Loading a ship with Sulphur at Galveston

Thousands of tons mined daily, but where does it all go?

PARAPHRASING an old saying: 'It takes a chemical to make a chemical,' certainly applies to hydrochloric acid.

No chemical engineer has to be told how hydrochloric acid is made but sometimes with the mind focussed on the word "hydrochloric" little thought is given to another word "sulphuric." It is this word that calls attention to the fact that to make one net ton of 20° Bé hydrochloric acid by the H_2SO_4 process requires about 950 pounds of this acid, basis 100%, which is equivalent to 320 pounds of Sulphur. About one third of the annual hydrochloric acid production is made by the use of sulphuric. The sulphur is not lost because salt cake, a by-product, also has commercial value. But any way you figure it, the hydrochloric acid industry is an important consumer of Sulphur in the form of sulphuric acid. In fact, it takes several days' production from all the Sulphur mines to take care of the annual production of this one commodity alone.



When one considers all the other chemicals that require sulphuric acid or other Sulphur compounds for their manufacture, it is not difficult to appreciate how faithfully the Sulphur Industry is serving industry today in spite of the great demands made upon it.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

this TRANSITE* Industrial Vent Pipe is good for many years more!

This 80-foot Transite stack vents corrosive gases from a trunk sewer in a large city. In excellent condition after 14 years of service, it has already outlasted the original metal breechings.

Typical of the long service life you can expect from Transite Pipe in solving tough venting problems, this durable asbestos-cement product successfully resists a wide variety of corrosive industrial fumes, gases and vapors which seriously affect other pipe materials in a short time.

Because Transite Industrial Vent Pipe is non-metallic and is therefore rustproof, it requires no maintenance —needs no paint or other protective treatment. Due to its unusually high chemical stability, it has substantially reduced replacement and maintenance costs in duct, vent and stack systems in plants across the country.

It is light in weight, easy to handle, easy to install, can be cut and drilled with ordinary tools. It comes in a complete range of sizes up to 36" in diameter . . . with a full line of rustproof, corrosion-resistant Transite fittings which make it adaptable to practically any job requirement.

For further details on Transite for industrial venting, write to Johns-Manville, Box 60, New York 16, N.Y. Ask for Data Sheet Series DS-336. In Canada: 199 Bay Street, Toronto 1, Ontario.

*Transite is a registered Johns-Manville trade mark

Johns-Manville
TRANSITE Industrial Vent PIPE

QED, *cont. . .*

ventional fields of science. In effect, it substitutes mathematical probability relationships for the less accurate common sense and intuition of an executive. Then it establishes the exact relationship between cause and effect throughout an operation.

Knowing these relationships, an executive is likely to make better decisions. For example, he should be able to vary the cause and get the same effect at less cost. In addition, difficult problems can be solved easily.

To mention a few: What is the effect of variations in inventories or sales volume on rate of return on investment? What product mix offers the maximum rate of return? How can tax liabilities be kept to a minimum?

Actually, the operations research man constructs a working model of an operation for the executive. The model is on paper however, built of complex mathematical formulas. By varying components in the formula, the researcher can predict over-all effects.

How It Happens: To get his model, the researcher has to first set up his problem. He might, for instance, take maximum rate of return of investment as the desired effect. He then would look at each part of the business to establish the relationship of each cause to this effect.

He might then break down rate of return into turnover multiplied by earnings as a percentage of sales, then set up differential equations containing these variables. He would then vary each factor to find its effect on rate of return. Thus he could answer such questions as, What effect would a variation of 1 percent in inventories have on rate of return? How is it affected by a change in sales volume? What is the effect of each additional dollar of sales? How much investment should be taken away from low-margin products and be spent promoting high-margin products?

Operations research is a war baby. According to Watson, the method was used effectively to solve such problems as how to sink enemy submarines in the shortest possible time and how to reduce factories to rubble at the least cost of men and machines. Since the war, it has been used, although sparingly, in industry. However, today as knowledge of its effectiveness becomes better known, operations research may be used more extensively.

. . . Odd Pollution Problem

When styrene and a halogen meet in the atmosphere, in the presence of sunlight, they react to form a potent eye irritant. In and around Midland, Mich., in recent years the two have been reacting often enough to challenge the resourcefulness of responsible engineers at the Dow chemical works. However to date, all such air pollution difficulties have been overcome, report E. M. Adams and E. J. Schneider of the company's biochemical research department.

Problem No. 1—In 1940 Dow introduced new ethylene processes at its Midland works. Before long, everyone at the works knew a newcomer was in the air. By the summer of 1941 investigators proved that two effluents were combining to produce a new and strong lachrymator.

This was first demonstrated in the field by releasing small amounts of chlorine or bromine upwind from a particular sewer outfall to a settling pond. The sewer brought waste water from the ethylene-product plants and carried styrene in the water.

In the initial problem, the waste water settling pond and buildings that housed electrolytic cells for the production of magnesium were situated too close together. Tremendous quantities of air were drawn through these buildings to remove chlorine escaping from the cells.

When the wind was right, hydrocarbon vapors escaping from the impounded water were drawn through the cell building and subsequently mixed with the chlorine. Plant environment would be contaminated for 2,000 ft. or more downstream.

Solution—Under existing conditions, What would be the quickest solution? Eliminate the source of styrene, Dow engineers figured. Therefore, these corrective measures were taken:

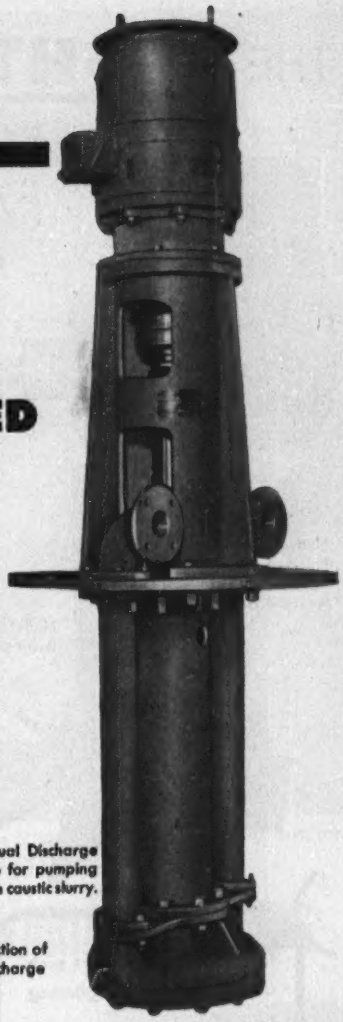
1. Improve the process by making mechanical alterations to reduce the loss of styrene into the sewer.

2. Decontaminate the waste water by simple blowing with air.

In addition, sources of halogen other than the magnesium cells were eliminated or minimized.

These measures for the most part controlled the formation of the eye irritant satisfactorily. However, when styrene was accidentally lost to the sewer a flood of complaints would come in. But before long, for econom-

VERTICAL PUMPS WITH NO SUBMERGED BEARINGS FOR PUMPING ABRASIVE CORROSIVE SLURRIES



2" Dual Discharge Pump for pumping molten caustic slurry.

Cross section of Dual Discharge Pump.

This rugged type of service calls for advanced design: — extra heavy shaft, double-ported casing to equalize the side thrust of the impeller, and tough abrasion-corrosion resistant alloys. The dual discharge pump illustrated here incorporates these features and dispenses with bearings or packing below the cover plate where they would be in contact with the liquid.

Difficult pumping problems, particularly in the process industries, have been our specialty for ninety-one years. Perhaps we can be of help to you. Write us — no obligation.

LAWRENCE PUMPS INC.

Write for Bulletin 203-6 for complete summary of acid and chemical pump data.

371 MARKET STREET, LAWRENCE, MASS.

THE **RIGHT** AGITATING EQUIPMENT SAVES YOU MONEY

Nettco Model KBA Side-Entering Agitator with V-belt connection to integrally mounted motor.

Model No. 6 Nettco Enclosed Bevel Gear Agitator Drive.

Famous Nettco Split Turbine Stirrer — for easy assembly in closed tanks.

Only Nettco offers such a wide range of agitating equipment:

- ✓Tank-top Agitator Drives
- ✓Double-motion Agitator Drives
- ✓Side-Entering Agitator Drives
- ✓In-the-pipeline Mixers (Flomix - Pat'd.)
- ✓Stirrers — turbine, propeller, paddle
- ✓Agitator fittings — couplings, bearings, etc.

Because a NETTCO Engineered AGITATOR is designed for the specific process requirements, it's sure to save money on the job. From the top bearing in the agitator drive to the stirrer in the tank — the complete Nettco Agitator is carefully worked out to take best advantage of Nettco's extensive line of standard components. The *right* agitating equipment—engineered and built by Nettco—is both economical to buy and economical to operate.

Find out now why it pays to pick Nettco. Send for information, recommendations, quotations. New England Tank & Tower Company, 87 Tileston Street, Everett 49, Mass.

NETTCO

Foremost in ENGINEERED AGITATION for over half a century

QED, *cont. . .*

ical reasons, the production of the magnesium was terminated and the problem ceased to exist.

Problem No. 2—In 1943, in the midst of wartime expansion and building, another plant and pond came into unfortunate association. Vapors from this pond, shown to contain styrene, mixed with the new source of chlorine when the wind came from the southeast.

Solution—At first no specific corrective measures were taken because southeast winds were infrequent. But at the end of the war, the source of chlorine was eliminated. This solved the immediate problem.

However since then, this second pond has been done away with. In this manner: During the course of expansion in ethylene production, sewer disposal was eliminated and a totally inclosed system installed for cooling the styrene-carrying quench water.

Problem No. 3—In 1948 bromate demand increased as the popularity of home-wave products grew. Using available space, Dow decided to locate new bromate cells in the old magnesium cell buildings.

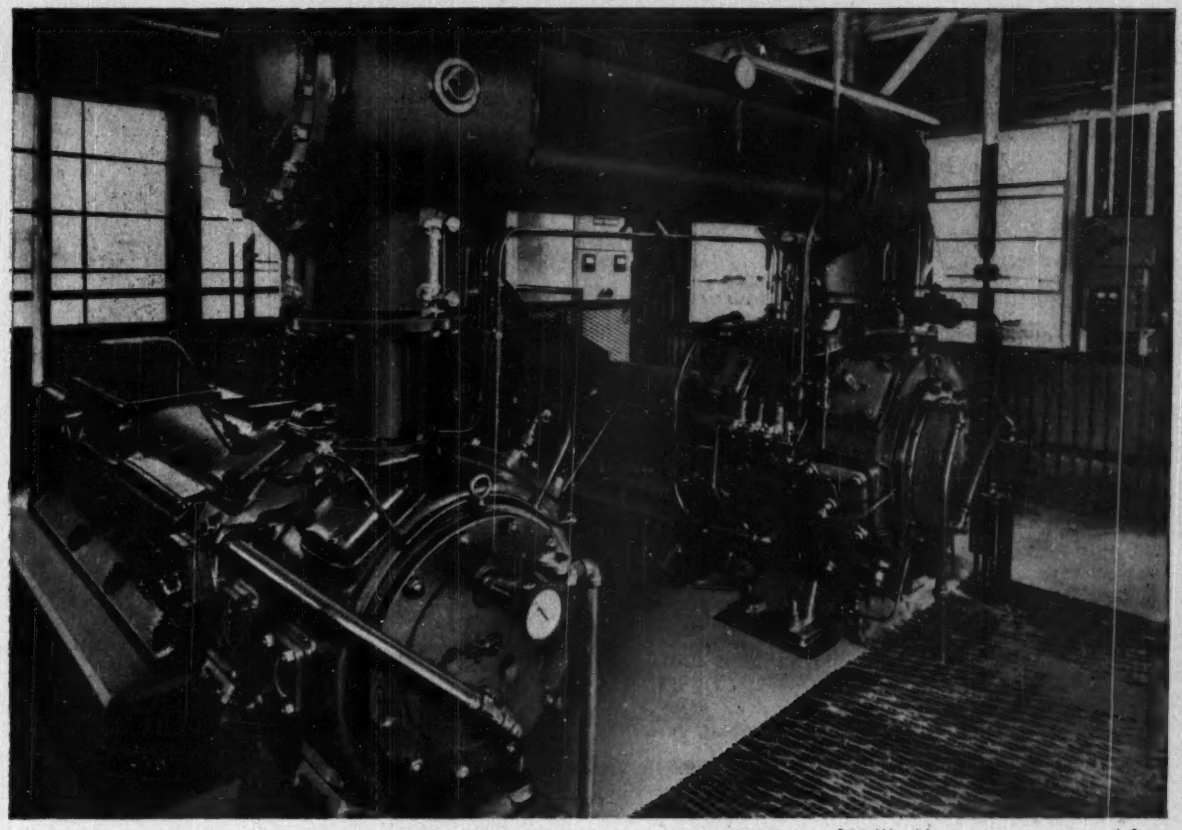
At the same time, polystyrene demands went up and other portions of the same buildings were used for styrene operations. Although little free bromine escaped from the cells, the lachrymator formed in certain quarters when the wind direction was right. In this instance, as in the previous two, there seemed to be an association between the occurrence of the lachrymator and the presence of sunlight.

Solution—To overcome the difficulty, Dow engineers redesigned the bromate cells, providing them with a scrubber to take bromine out of the exhaust air. However, if anything goes wrong, they can still stop the cell operation until the wind shifts or they can hold up the styrene operation.

HIGH TEMPERATURE ALLOYS

Continued from page 169

Addition of carbide stabilizing elements preferably chromium and molybdenum effectively prevents hydrogen attack at high temperatures. G. H. Nelson, in a paper "Hydrogenation Plant Steels" given April 6, 1949, before the A.P.I. division of refining, presents an experimental graph of operat-



WORTHINGTON DC-2 HORIZONTAL AIR COMPRESSOR, one of 14 Worthington compressors used for various services at the Girard Point, Pa., station of the Gulf Oil Company.

THIS COMPRESSOR KEEPS PACE WITH VARIABLE LOADS

Like compressors in industry everywhere, this installation at a large eastern refinery must face many variable load problems. Unless properly handled, variable compressor loads often result in wasted power and high running costs.

Worthington Five-Step Variable Capacity Control solves this problem.

The by-pass regulation—as achieved by suction valve unloaders and clearance pocket unloaders—is exclusively Worthington and offers these important advantages:

Economy of power—the air required at any moment determines the power used.

Simplicity—inlet valves and unloading mechanism form one individual element, easily accessible.

Low operating temperatures—a cooler cylinder insures improved lubrication and low oil consumption.

This Type DC-2 compressor is also equipped with the exclusive Worthington Feather* Valve—the lightest and most efficient compressor valve available.

Write for air compressor bulletin L-675-B1B to your nearest Worthington district office or to Worthington Corporation, Compressor Division, Buffalo, New York.

*Reg. U. S. Pat. Off.

A GLANCE AT THE INDICATOR PANEL of the Worthington five-step governor shows operating capacity at any moment.

K.2.13

No Other Compressor Will Outperform a Worthington

WORTHINGTON

Compressors

Niagara's HYGROL DRIES AIR BEST

with exact moisture content

- to control your product's quality
- to prevent condensation on your product or material
- to prevent changes due to moist air in contact with your product
- to protect your material from dampness
- to protect your processing of moisture-sensitive material
- to DRY your material or product
- to pack or store your product safe from moisture damage
- to get exact moisture control for the precise atmosphere condition you need
- to provide precise atmospheric conditions for testing
- to increase your air conditioning capacity
- to DRY large quantities of fresh air from outdoors

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Niagara Controlled Humidity Air Conditioning

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

For complete information write

NIAGARA BLOWER COMPANY

Dept. CE, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities of United States and Canada

ing limits for various steels in a hydrogen atmosphere.

Steam

Steam is an oxidizing agent and at high temperatures has about the same effect as air. Chromium addition and silicon addition, as in the case of any other type of oxidizing atmosphere, will have beneficial effects. 25-20 tubes have been used to generate superheated steam in the range of 1,600 to 1,800 deg. F. for special process applications. Inconel has also been used.

Nitrogen

Steels at high temperatures and pressures in a nitrogen atmosphere will absorb nitrogen and form a hard brittle case of iron nitride. The surface tends to crack which in turn results in a stress concentration that leads to failure. Nitrided steels are more susceptible to corrosion.

Nickel in steels inhibits nitriding. Austenitic steels are the most resistant of the commercially available steels. The particular type of steel to use in a given nitrogen atmosphere depends on experience and preference.

HIGH TEMPERATURE PHENOMENA

Graphitization

Graphitization involves the decomposition of cementite (iron carbide) into its elements iron (ferrite) and carbon at high temperatures. It occurs in carbon and carbon-molybdenum steels in the range of 825 to 1,300 deg. F., the maximum rate occurring around 1,200 deg. F. The decomposed carbon takes the form of graphite which weakens the steel.

There are two types of graphitization. The first involves the formation of uniformly distributed graphite. This results in a reduction of the room temperature mechanical strength of the steel. It does not affect high temperature service, however, as creep resistance of the steel governs and creep resistance of carbon and carbon-molybdenum steels depends primarily on the characteristics of the ferrite.

The second type of graphitization involves the formation of graphite in highly concentrated individual areas. This most frequently occurs around a welded joint at the low temperature edge of the heat affected zone. This condition will ultimately lead to failure if graphitization continues to take

place. This is the type of failure most often reported.

Aluminum promotes graphitization of carbon and carbon-molybdenum steels. Most authorities recommend restricting aluminum content of "killed" carbon steels to a ½ lb. per ton. This is not desirable from the mills standpoint and some metallurgists question its effect. Silicon "killed" steels such as A-201 resist graphitization. Chromium added to steel will produce a steel highly resistant to graphitization and a steel with 1 percent chromium will be practically immune to it.

Some metallurgists think control of grain size minimizes deleterious effects of graphitization. Coarse grain structure results in large graphite agglomerates. Fine grain increases tendency to graphitize. A medium grain structure of about 3-4 ASTM is considered most desirable. This also limits the quantities of aluminum used in "killing" the steel.

Carbide Precipitation

This phenomenon occurs in austenitic chrome-nickel steels in the temperature range of 800 to 1,550 deg. F. The carbon present in solution combines with chromium as chromium carbide and precipitates out at the grain boundaries. The chromium-depleted areas adjacent to the grain boundaries are preferentially attacked in corrosive service. Where intergranular corrosion is not a problem, severe carbide precipitation will lead to brittleness. In many cases, however, it can be tolerated where corrosion is not a factor.

Carbide precipitation can be prevented by the addition of titanium or columbium to the stainless steels, i.e., types 321 and 347. They prevent chromium carbide precipitation by the formation of their own stable carbides. Their use is not warranted in severely carburizing atmospheres as they can only hold down a finite amount of carbon before chromium carbides start to form.

Heat treatment of steels having precipitated carbides will send the carbon back into solution. Here temperatures have to be in the range of 1,900 deg. F. However, further exposure to the sensitive range will cause the carbides to reprecipitate.

Temper Brittleness

Temper brittleness is an embrittle-

View above shows Prater Rotary Airlock Feeders in a bread crumb drying and grinding system using Prater Mills for primary and secondary reduction at a large mid-western bakery.

At left is a close-up showing simplicity of installation.

AIRLOCK AND FEEDER IN ONE MACHINE

Whether you want to stop air leakage in a conveying system or feed powdered material into a vessel against pressure, a Prater Rotary Airlock Feeder will do the job. As a FEEDER . . . it can be used to unload hoppers or bins of free flowing materials at a controlled volumetric rate. As an AIRLOCK . . . it seals off dust collectors, spray dryers, air-classifiers, or other pneumatic equipment. These Feeders are delivered as a package unit — ready to install, ready to operate.

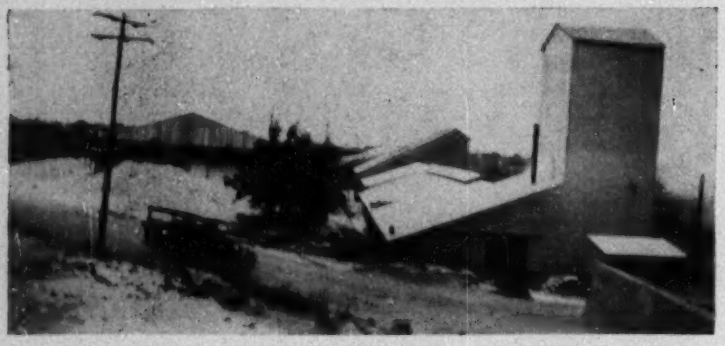
GET THIS FREE BULLETIN

. . . tells what the Prater Rotary Airlock Feeder is — what it does — where it is used. Contains valuable engineering data. Write today.

PRATER PRATER PULVERIZER CO.
1517 S. 55th Court, Chicago 50, Ill.

COMPLETED...

Our New and Modern Hackleburg, Alabama Number 2 Processing Plant



- **Equipped with the Latest Processing and Automatic Material Handling Equipment**
- ***Large Production to Better Serve Big Industry***
- **"TAKO" The Pure High Grade Airfloated Colloidal Kaolinitic Kaolin**
- **"A Guarantee for Cons ant Quality"**

Micron Size

%	Microns
43.6	0 - ½
12.2	½ - 1
12.6	1 - 2
14.2	2 - 5
6.9	5 - 10
10.5	10 - plus

Write us for Large Workable Experimental Sample for Your Investigation

P.C.C. CONE 34-35

Chemical Analysis

SiO_2	44.69%
Al_2O_3	39.67%
TiO_2	1.65%
Fe_2O_3	0.57%
CaO	0.00%
MgO	0.00%
$Na_2O_3K_2O$	0.00%

THE THOMAS ALABAMA KAOLIN COMPANY

2412 KEN OAK ROAD, BALTIMORE 9, MARYLAND

MINES & PROCESSING PLANTS: HACKLEBURG, ALABAMA

- PROMPT SHIPMENTS
- HAND SELECTED CRUDE LUMP
- AIRFLOATED SPECIFICATION
- BULK OR BAGGED

QUALITY SERVICE SINCE 1939

TAKO

ALABAMA'S FINEST

ment that occurs in straight chromium steels of chromium contents less than 11.5 percent when heated in the range of 850 to 1,100 deg. F. and slowly cooled. It is believed due to the precipitation of one or more unknown substances from solution. As a result of temper brittleness, parts will fail at room temperatures when subjected to shock. Molybdenum, when added to the chromium steels, diminishes the tendency towards temper imbrittlement. Since most commercial non-austenitic chromium steels contain molybdenum, temper brittleness is no longer of much concern.

Spheroidization

This phenonenon involves the dispersal of the ferric carbide of carbon and carbon-molybdenum steels from their initial plate-like form to a spheroidal form. Annealed steels resist spheroidization to a greater degree than normalized—coarse-grained steels to a greater degree than fine—and silicon "killed" steels to a greater degree than aluminum-killed. In most applications of carbon and carbon-molybdenum steels at elevated temperatures, the rate of spheroidization does not affect creep strength to an extent where that phenomenon has to be considered.

Sigma Phase Precipitation

Sigma phase precipitation involves the precipitation of ferric chromide (FeCr) in high chromium alloys such as plain 27 chromium, the various 18-8's, 25-12, and 25-20 steels. It takes place at temperatures below 1,600 deg. F. A non-austenitic structure such as that of plain 27 chromium favors its formation. It results in a loss of strength and brittleness.

885 Deg. F. Brittleness

This embrittlement occurs in ferritic chromium steels (over 12% Cr) in the temperature range of 820-950 deg. F. The loss in ductility is apparent only at room temperature, so that the high temperature properties are unaffected.

PHYSICAL PROPERTIES

Physical and mechanical properties of steels should be carefully considered for all high temperature applications.

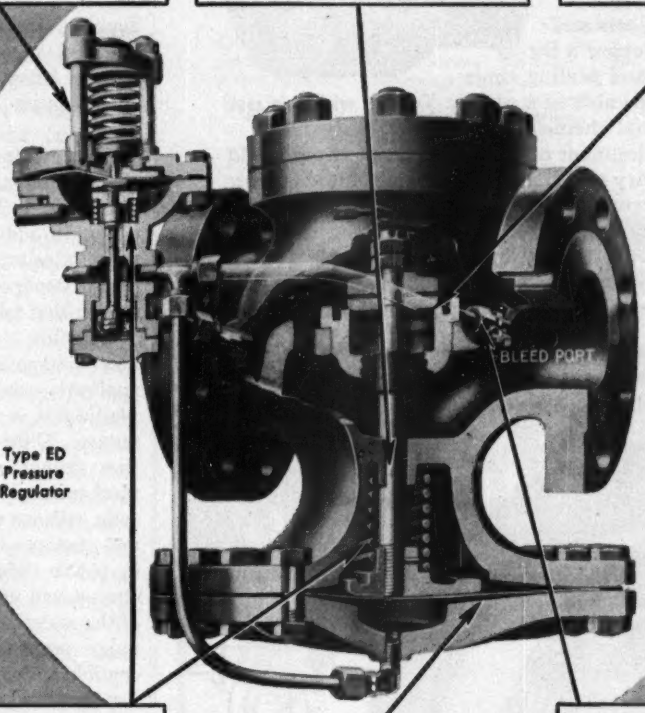
Some of the more important properties worth considering are: (1) creep and rupture strength, (2) ductility

ONLY SPENCE REGULATORS ...give you all these design advantages

Separate Interchangeable Pilot . . .
controls main valve . . . simplifies inspection and maintenance.

Packless Construction . . .
minimizes friction . . . improves control accuracy and eliminates much time-consuming maintenance.

SECO Metal Seats and Discs . . .
resist wiredrawing. More than 20 years of experience has failed to produce a single case where SECO Metal was cut by steam.



Type ED Pressure Regulator

Dead-End Shutoff . . .
guaranteed on steam service when a balanced, single-seated main valve is equipped with SECO Metal seat and disc and is protected by an approved strainer.

Internal Springs . . .
out of path of steam or other fluid flowing through the valve. They operate at low unit stress for exceptionally long life.

Large Balanced Metal Diaphragms . . .
located in a cooled zone with a condensate seal above and below, under usual conditions, never need replacement.

Ease of Inspection . . .
quick access to all vital elements of regulator. No special tools needed.

These Spence design features explain why Spence Regulators function dependably and accurately year after year, without requiring extensive repairs or special attention. This lowers over-all costs . . . means less down-time of the system. • Spence makes a complete line of automatic regulating valves: pressure reducing, differential pressure, back pressure control, pump governor, temperature regulating and other types. Write for Bulletin giving full details.

Spence

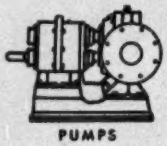
SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

new mechanical seal
JOHN CRANE with TEFLON*
Solves Corrosion and Temperature Problems...

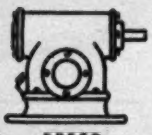
With the new Type 9 John Crane Mechanical Seal, proper sealing of chemicals and corrosive liquids is no longer a factor. Its flexible wedge and sealing rings are molded of the remarkable new plastic Teflon, which is not affected by any industrial chemical.

The successful development of two years research and field testing, this revolutionary seal handles corrosive liquids never before controlled effectively by conventional, flexible type mechanical seals. Thus, John Crane designing experience is effectively combined with the unique properties of Teflon: chemical inertness, extremely low friction and high heat resistance. Type 9 Seal can be employed at temperatures up to 500°F.

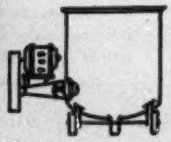
WRITE TODAY FOR *NEW* BOOKLET
describing the John Crane Type 9 Shaft Seal. Crane Packing Co., 1809 Belle Plaine Ave., Chicago 13, Illinois.



PUMPS



SPEED REDUCERS.



MIXERS AGITATORS

* Registered DuPont Trade-mark for tetrafluoroethylene resin

JOHN CRANE CRANE PACKING COMPANY

and brittleness, (3) weldability, and (4) coefficient of thermal expansion.

Strength of materials is generally tied into the economics of selecting steels for high temperature service. Stronger materials make for lighter parts except that the unit price of the stronger materials is generally higher.

Fabrication of very heavy plate involves more welding so that fabrication costs tend to be higher where thicknesses are considerable. In general, selection should be made so that plate thicknesses are less than 1-¼ in. Shops are more frequently set up to work only with plate up to 1-¼ in. thick and the use of heavier plates results in the limitation of sources of supply. Inevitably exceptions exist and very large vessels will necessarily require heavy plate for the bottom shell courses and bottom cones or heads.

The basis for establishing the allowable stresses at high temperatures is discussed in the last section of this paper. In addition, the strength cost basis for selecting steels from an economic standpoint is discussed in the section that follows.

Ductility (or conversely, brittleness) is important in high temperature applications because the condition of plastic flow is definitely anticipated in service. Differences in thermal expansion cannot always be resolved by mechanical design. There is always some reliance on self-relieving of thermal stresses—which necessarily result in plastic deformation because these stresses will exceed the yield strength of the material. The martensitic steels unless properly heat treated are susceptible to cracking in the initial heating up period due to their lower ductility. During continuous operation at high temperatures, however, there is less likelihood of failure. Thermal stresses once accommodated initially will decline at elevated temperatures due to creep behavior.

Brittleness does become a problem for ferritic chromium steels having more than 12 percent chromium during long exposure to high temperatures. Heating in the range of 800-1,100 deg. F. causes the metal to be brittle when cold. Ductility at the higher temperatures is unimpaired in this case. If the service temperature exceeds 1,500 deg. F., grain growth is rapid and a coarse grain structure results. Although a coarse grain struc-

ture is stronger than a fine grain structure, the former tends to have a lower ductility and is less capable of tolerating high localized stresses.

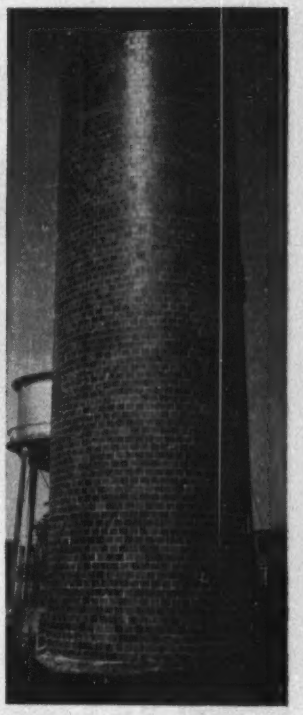
Coefficient of thermal expansion of metals in high temperature service is an important factor in mechanical design due to the large difference in temperatures between fabrication and operation. The use of welded joints in pressure vessel fabrication has become almost universal; yet the restrictions to expansion with these joints present many serious problems.

An example of such difficulties is the continuous welding of alloy plate to carbon steel where differences in the coefficients of thermal expansion may be as high as 25 to 30 percent. It can be shown that an increase in temperature above ambient amounting to 200 to 300 deg. F. will result in the yield strength being exceeded when austenitic stainless steels are welded to carbon steels. A good example of this phenomenon is the failure of plurimelt-lined reactors in fluid catalytic cracking units which cracked as a result of the greater thermal expansion of the 18-8 stainless steel cladding as compared to the main carbon steel plate used in the shell of the vessel.

Martensitic chromium steels have lower coefficients of thermal expansion than carbon steel and the difference in coefficients is not as great as for austenitic stainless steel and carbon steel. In general, the straight chromium alloy steels will have lower coefficients of thermal expansion as the chromium content increases so that the difference as compared to carbon steel becomes greater for the high alloys. In all cases the austenitic stainless steels will have 25 to 30 percent greater coefficients of thermal expansion than carbon steel.

Difficulties in welding dissimilar metals have been somewhat overcome by the use of 25-20 chromium-nickel welding rods for even the heaviest welds. It would appear that a heavy rod of austenitic weld metal lying between carbon steel and alloy plate and operating at elevated temperatures would result in extremely high stresses and possibly failure. The experience has been, however, that failure does not generally occur due to the ductility of the austenitic material plus the transition in alloy contents in the edges of the welded zones. Since this is a subject of controversy, it is better to avoid such dissimilar welds. Where it is felt that such de-

GOT BULK STORAGE PROBLEMS?
... solve them with
Kalamazoo GLAZED TILE INDUSTRIAL STORAGE BINS



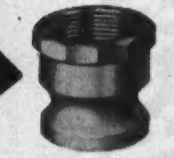
Coal ... cement ... clay ... plaster ... fertilizer ... whatever the material, Kalamazoo glazed tile hollow-wall construction protects it from condensation, freezing and corrosion ... keeps it always clean and dry ... eliminates waste, shrinkage, spoilage.

And, the clean-cut neatness of Kalamazoo Glazed Tile Storage Bins complements the appearance of modern industrial buildings ... an added Kalamazoo advantage.

Write today for complete information.

TILE TANK DIVISION
224 HARRISON ST., KALAMAZOO, MICHIGAN
Kalamazoo TANK and SILO CO.

EVER-TITE
The Best In Quick Couplings



EVER-TITE Couplings speed deliveries ... prevent leakage ... save spillage ... because they give a *quick, sealed* connection that stays *tight.* They are the finest couplings made — with durable bronze construction.

Get *EVER-TITE* quality — and get years of *dependable* service.

EVER-TITE COUPLING CO. INC.
254 West 54th Street, New York 19, N. Y.

There's an EVER-TITE for every need
Ask your distributor

UNIQUE NEW Sier-Bath External Gear & Bearing Bracket Type SCREW PUMP
FOR non-lubricating fluids, semi-fluids. Capacities 1-700 GPM; Discharge 1000 PSI for viscous liquids, 500 PSI for water. Also available in Hopper and Liner Types.
RUGGED BRACKETS won't twist rotors out of alignment.
THRUST BEARINGS for less wear on bearings and timing gears. Double-row angular contact ball bearings position rotors axially.
INTERCHANGEABLE ROTOR SCREWS make major overhauls simple, inexpensive—greatly reduce need (and expense) of periodic pump replacement.
SINGLE-POINT ALIGNMENT speeds servicing—eliminates rotor distortion during installation, or when handling hot material.
GEAR HOUSING center line supported —doweled for accurate alignment. Faster assembly—all parts automatically positioned by shoulders, locknuts.
ROLLER BEARINGS where they're needed—at point of high radial load.
RIGID BEARINGS outboard of timing gears —prevent shaft whip".
For Further Information, See Your Local Sier-Bath Representative, or Write to Factory
Also Manufacturers of Gearex Pumps, Precision Gears, and Gear Couplings
Sier-Bath GEAR and PUMP CO., Inc.
9259 HUDSON BLVD., NORTH BERGEN, N. J.

sign is absolutely necessary, metallurgists should be consulted to pass on the design and set up the proper fabrication techniques.

Problems in weldability of steels are primarily involved in the field fabrication of high temperature equipment. Shop techniques and ready availability of heat treating furnaces in large size fabricating shops have minimized to a large extent the problems in shop welding alloy steels and very heavy carbon steel plate. The decision of some large oil concerns to use ½ to 1 percent chromium—½ percent molybdenum alloy steels as a means of preventing graphitization in the fluid catalytic cracking reactors (which, due to their size, are field fabricated) has pointed up the problems of field fabricating vessels of alloy plate.

Considerable difficulty was encountered in finding vendors who were willing to field-fabricate large alloy vessels because of the necessity of preheating during welding and of stress-relieving the vessel after fabrication. Field stress relieving is certainly not as desirable as a furnace heat treatment, and where alloy materials are involved, the higher temperatures required for stress relieving have presented problems in installing special equipment at considerable extra cost for this purpose.

Least desirable materials for use in field fabrication are the martensitic alloy steels which are subject to air hardening and require special fabrication techniques. Where unstabilized austenitic stainless steels are used for equipment involving field fabricating, the phenomenon of carbide precipitation will be met. This is not a problem, however, if the stainless steel is to be used in a non-corrosive service. Where corrosion is a problem, an annealing treatment to redissolve chromium carbides is necessary. This operation can only be accomplished in a shop furnace due to the high annealing temperature required.

Where parts or equipment are subject to considerable wear during service, and cannot be removed from the field for shop repair, they should be fabricated of materials not requiring special welding techniques that involve preheating and postheating operations.

—End

FRONT COVER—Humble Oil and Refining Co., Baytown, Texas. Photo courtesy of Standard Oil Co. (N. J.)

STURTEVANT ROTARY FINE CRUSHERS

Crush or Granulate to Fine, Even Sizes without Excess Dust...

Cross section view illustrating the crushing action

These rugged crushers speed output of fines, cut reduction costs. Desired fineness is quickly obtained by regulating hand wheel. "Open-door" accessibility permits fast, easy cleaning. They crush fine . . . crush fast and do not clog. Available in output capacities from 1 to 30 tons-per-hour. Write for catalog.

STURTEVANT MILL COMPANY
100-A CLAYTON STREET, BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

CLIP AND MAIL COUPON TODAY

Sturtevant Mill Company
100-A Clayton Street
Boston 22, Massachusetts

Gentlemen:
Please send me catalog describing your Rotary Fine Crushers. I am interested in crushing_____

*Name*_____

*Street*_____

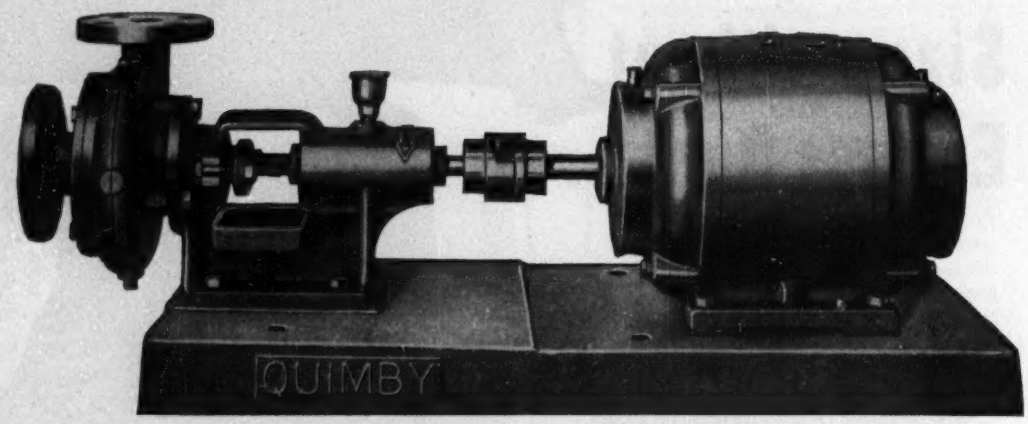
*City & State*_____

*Firm*_____

FOR PROCESS AND MEDIUM DUTY CHEMICAL SERVICE

dependability and economy are assured

with this Warren-Quimby Type "G" Pump



This Warren-Quimby Pump is designed to give both dependable and thoroughly economical satisfaction in process industries and chemical plants having semi-critical requirements. It has proven its merit conclusively whenever correctly applied.

Simplicity of design, sturdy bearings, extra deep stuffing box, tapped catchall, together with strong construction throughout the entire rigid assembly, all contribute to long, useful life at moderate cost.

It is available in 1, 1¼, 1½, 2 and 3 inch discharge sizes. Capacities up to 400 GPM—heads up to 240 feet.

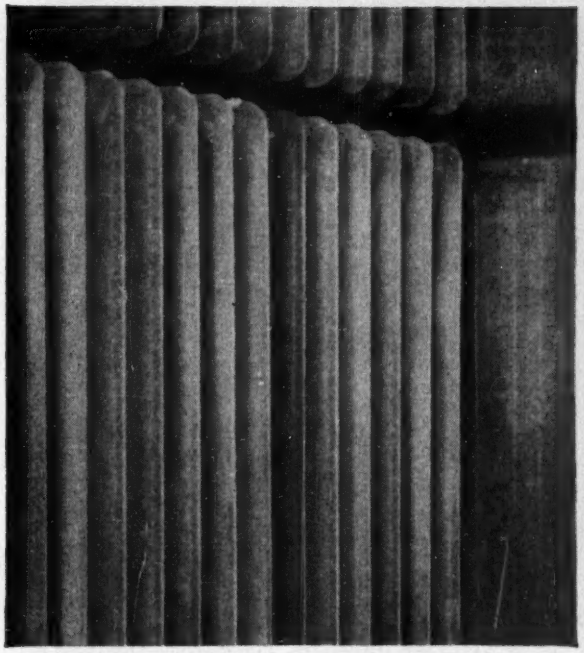
WARREN QUIMBY PUMPS

SEND FOR BULLETIN WQ-213 giving Specifications, Selection Chart, etc.

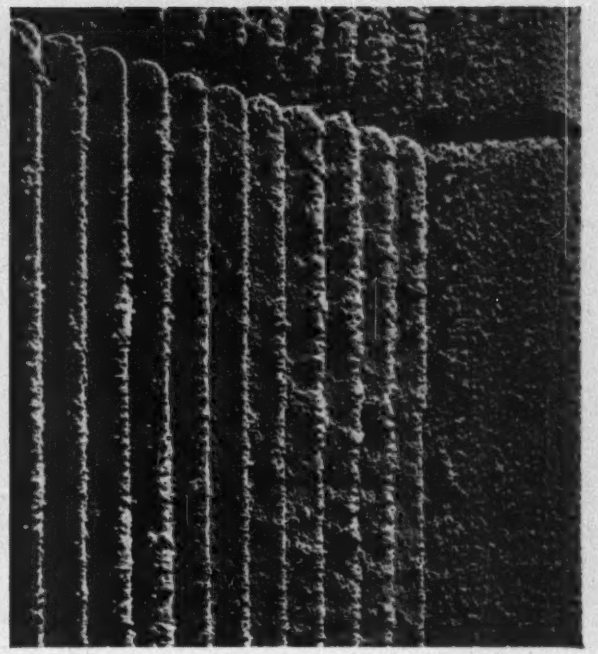
CQ-4

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS



Before—PRECIPITRON® cells in close-up show clean aluminum collector plates. This is the way they appear after periodic washings, which dispose of all trapped airborne particles.



After only 2½ weeks cleaning "normal atmospheric" air, the same plates had accumulated this much dirt. PRECIPITRON stops airborne dirt, pollen, mists—even germs and smoke!

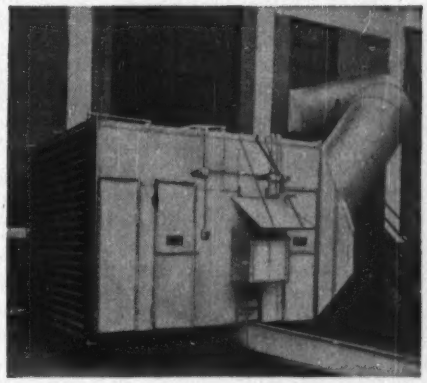
ELECTRONIC BARRIER

AGAINST INVISIBLE DIRT

Contamination by bacteria-carrying particles is costly in laboratories and food processing plants. In textile mills, airborne specks streak the yarns, change premium-commanding light shades into dark. In your processes, buildings, offices—even your own home—"invisible" dirt costs you money.

But PRECIPITRON—the electronic air cleaner—will take *all* the dirt out of the air. It removes particles so tiny they can be seen only with an Ultra Microscope. The savings in controlling airborne dirt with PRECIPITRON are worth looking into today.

To help you *put air to work*—with air cleaning, air conditioning or air handling—Westinghouse offers a complete equipment line. For a free copy of General Catalog 600, call your local Westinghouse-Sturtevant Office. Or, write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.



Cleaning efficiency of PRECIPITRON is 90% or better at 333 fpm. Dirt is held on the plates until washed down. A garden-type hose flushes it directly into the drain—quickly, easily, inexpensively.

YOU CAN BE SURE...IF IT'S **Westinghouse**

AIR CLEANING

J-802278

Chemical Engineer's Bookshelf

Edited by Lester B. Pope

Silicates

SOLUBLE SILICATES. Second edition. Vol. I: Chemistry. By James G. Vail. Reinhold Publishing Corp., New York. 357 pages $9.

Reviewed by John W. Ryznar

A 1928 edition of "Soluble Silicates in Industry" by Vail has been replaced by an extensively revised two-volume monograph. Vol. I is devoted primarily to the more theoretical work on the properties and chemistry of the soluble silicates, while Vol. II covers industrial applications.

This book is No. 116 in the American Chemical Society Monograph Series and represents an authoritative review of the chemistry of soluble silicates.

The technical material published on soluble silicates has been increasing at a logarithmic rate. Reference is made in this book to over one thousand authors. In spite of the very extensive literature on this subject, this monograph succeeds very well in presenting an inclusive, well organized and critical survey and review of this field.

The book is divided into five chapters covering beginnings, present practices, homogeneous systems, heterogeneous systems and complex systems. Very complete author and subject indexes are included.

Since soluble silicates are so widely used in industry—there are few manufacturing plants which do not make some use of them—this book should prove valuable to a great number of readers. It will be useful to the trained specialist as well as to the non-trained but interested reader.

Compilation

ELECTROCHEMICAL DATA. By B. E. Conway. Elsevier Press, Houston. 374 pages. Price $8.75.

Reviewed by H. C. Miller

"Electrochemical Data" was written to fill a long-felt need for a comprehensive collection of the varied data in the electrochemical field. It proves to be a very fine compilation of the data of known accuracy, and it should be of interest not only to the electrochemist but also to the physical chemist and the bio-physicist. It contains over two hundred fifty tables, which are grouped into ten chapters under such general headings as universal constants, physical properties, molecular and ionic interaction in the liquid phase, transport in solutions, reversible electrode processes, and electrochemistry of melts at high temperature. Each chapter has an introductory sketch, and all tables are fully supplemented by bibliographical information. The book is well indexed for ready reference.

Political History

THE MEMOIRS OF HERBERT HOOVER, 1929-1941, THE GREAT DEPRESSION. The Macmillan Co., New York. 503 pages. $5.

Reviewed by H. C. Parmelee

Students of political history will be grateful to Mr. Hoover for painstaking care in documenting his story of The Great Depression that spread its blight over the United States from 1929 to 1941. It was an era of violent controversy, artful propaganda, charge and countercharge, political chicanery, intellectual dishonesty, economic nostrums, and financial tinkering.

Small wonder that the average citizen was confused at the Babel of political and economic voices claiming his attention and allegiance. Even less wonder that he never understood the hidden and complex forces that molded his destiny through 12 fateful years. But the story has now been written by Mr. Hoover with such clarity and honesty that he who runs may read and understand.

Although Mr. Hoover's political opponents of the moment found in him a scapegoat for the depression and sought to label it with his name, this bit of fiction has not withstood the testimony of impartial economists. The concensus is that the primary cause of The Great Depression was the war of 1914-1918 and its aftermaths that ultimately brought about the collapse of most European economies. Rumblings of this storm came out of Europe as early as 1927, but it did not break in full fury until 1931, about the time the United States was convalescing from its orgy of stock speculation that ended in the slump of 1929. But for the impact of this external influence, we should have recovered our domestic balance in a short time. The stock market crash of 1929 did not pull down the world. On the contrary, the economic ills of the latter intensified our own troubles and prolonged the depression.

The domestic boom of the 1920's which blew up in 1929 was due largely to a wave of optimism that found expression in a "new economic era" in which the old laws of economics no longer applied. This was aided by the deliberate inflationary policies of the Federal Reserve Board and a weak banking system. While still Secretary of Commerce Mr. Hoover had cautioned against speculation and credit inflation, but to no avail. As President he later took drastic action to avoid the collapse, and still later to temper its effects on industry and agriculture. Anyone who still labors under the delusion that Mr. Hoover did nothing to alleviate the aftermath of the crash and the successive phases of the depression should read in detail the extraordinary remedial measures adopted to cushion the shock, prevent panic, and alleviate distress among the unemployed and farmers. The record speaks for itself.

In order to give the reader clear economic perspective, Mr. Hoover discusses the depression in six phases. Each was different from the others. Each had its new destructive forces and reached its own crisis. Each called for, and received, its own remedial measures. Five of these phases occurred in Mr. Hoover's administration. The sixth began with the inauguration of Mr. Roosevelt in 1933.

The first phase covered the period from the October, 1929, stock market crash to April 1931. The second comprised the four months from April through July 1931, when we suffered the first impact of the financial troubles of Continental Europe. The third phase also lasted about four months, beginning in August 1931, when Britain went off the gold stand-

Engineered "Wool" . . . to keep a baby warm!

Lucky baby!

You can sleep like a top under your soft Dynel blanket. For it's as warm as wool, yet it has properties a sheep never dreamed of . . . and they were engineered into it by modern chemical science. Dynel is strong, flame-proof, mildew- and moth-proof. It's light, and comes from the wash as fluffy as a kitten.

Dynel, Orlon, Dacron, Acrilan, Vicara, and other man-made "wonder" fibers are made from chemical solutions. These raw solutions must be kept absolutely pure as they pass through hundreds of valves that control their flow and regulate their proportions on the way to spinnerets, where these solutions are transformed into gossamer textile fibers. To guard against any contamination or discoloration resulting from valve corrosion, the manufacturers of Dynel and other new synthetic fibers use ALOYCO Stainless Steel Valves.

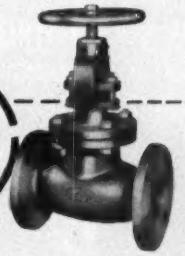
Like the manufacturers of engineered fabrics, other leading chemical firms, handling everything from blood plasma to oil refinery sludge, have brought their problems of corrosion, contamination, discoloration, and extreme temperatures to *Aloyco's Corrosion Engineering Service*. There, in the laboratories of the world's largest specialists in corrosion-resistant valves, the right alloy and the right type of valve have been determined for every specific corrosive situation. In fact, ALOYCO valves go hand-in-hand with chemical progress.

So if corrosives play a part in your business, write to ALOYCO about your own valve needs. Our engineers will be glad to test various alloys under your actual line conditions, and on that basis, recommend the best valve for each particular assignment.

ALLOY STEEL PRODUCTS CO., INC.
1300 West Elizabeth Avenue, Linden, N. J.
Plants: Linden, N. J.; Bloomfield, N. J.; Elizabeth, N. J.

3.1

Longer Lasting
ALOYCO VALVES
1st in Corrosive Service



DISTRICT OFFICES

NEW YORK 1, NEW YORK — 350 Fifth Avenue
WILMINGTON, DEL. — 226 West Ninth St.
PITTSBURGH 22, PA. — 318 Investment Bldg.
ATLANTA, GEORGIA — 333 Candler Bldg.
ST. LOUIS, MISSOURI — 1221 Locust St.
CHICAGO 4, ILLINOIS — 332 So. Michigan Ave.
HOUSTON 6, TEXAS — K. E. Leger Co., 2716 Danville St.
SAN FRANCISCO, CALIF. — 24 California St.
LOS ANGELES 22, CALIF. — 5442 Jillson St.

A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability

Superior Steam Generators are manufactured in 16 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details, write for Catalog 322

Factory: Emmaus, Pa.
Exec. Offices: Times Bldg, Times Sq., New York N. Y.

SUPERIOR STEAM GENERATOR

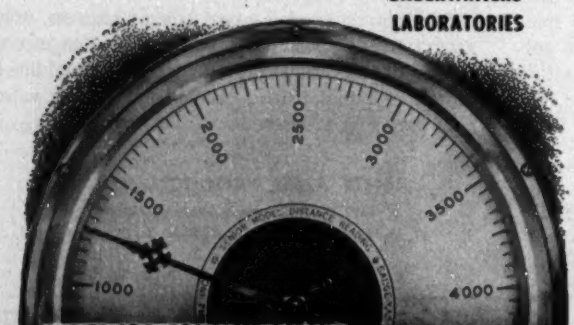
"LIQUIDS WORTH STORING ARE WORTH MEASURING"

with a

LIQUIDOMETER

Tank Gauge

- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES



WRITE FOR COMPLETE DETAILS

THE LIQUIDOMETER CORP.
36-29 SKILLMAN AVE., LONG ISLAND CITY 1, N.Y.

ard. The fourth period began in December 1931 and lasted about eleven months. It was during this phase that the depression reached bottom about June 1932. The fifth phase began with the election of 1932 and developed primarily from public apprehension over the unorthodox economic and financial policies proposed during the campaign by leaders of the New Deal. The sixth phase was ushered in with the inauguration of Mr. Roosevelt and continued for a period of eight years.

In many respects the fourth and fifth phases of the depression must have been the most distressing to Mr. Hoover. The economic strain was intensified by hostile political action. A Democratic Congress gave grudging support to proposed measures for economic defense and recovery, and adopted tactics of obstruction and delay. And when belated cooperation resulted, for example, in the creation of the Reconstruction Finance Corporation, its powers and authority were limited and some of its best features eliminated. In this, as in other constructive measures proposed by Mr. Hoover, and emasculated by Congress, all of his proposals were adopted when the New Deal came into power. Banking reform was another vital measure advocated by Mr. Hoover for several years before the Senate finally passed the Glass bill. But the Democratic leaders of the House, with election near at hand, refused to take action on instructions from the President-elect. The Glass bill was passed promptly by the succeeding administration.

One result of this political opposition was to delay recovery until it would be too late to affect the presidential election of November 1932. Naturally it proved disastrous to the country. But worse was to come.

The hostility of Congress was matched after election by the refusal of Mr. Roosevelt to cooperate with Mr. Hoover, during the interregnum of four months, in dealing with some vital recovery problems. In spite of repeated efforts to enlist Mr. Roosevelt's cooperation, aside from a formal exchange of notes he remained aloof from any negotiations. With respect to the matter of war debts, for example, Mr. Roosevelt told reporters that "it was not his baby." And when the banking situation grew serious he

persisted in his refusal to cooperate in adopting measures that might forestall disaster.

Some years later Raymond Moley explained Roosevelt's action by saying that "he either did not realize how serious the situation was, or he preferred to have the conditions deteriorate and gain for himself the entire credit for the rescue operation. In any event, his actions . . . would conform to any such motive on his part." Certainly Nero couldn't have betrayed less concern for the fate of Rome than Roosevelt showed for his country's welfare.

Mr. Hoover devotes a chapter to the four years of personal attack by the Democrats in order to discredit him as a candidate to succeed himself. Others may have been discredited by amateurs, but Mr. Hoover may claim the distinction of having been smeared by experts. Charley Michelson and Jouett Shouse were delegated by the Democratic National Committee to conduct the campaign of misrepresentation and slander, and they were supplied with ample funds to do so. Phony scandals were invented, smear books were written, and the facts of the Bonus March were distorted. And although all were subsequently shown to be false, the accusations persisted for many years.

Special attention is devoted to the campaign of 1932 because the election marked a turning point in American life. Mr. Hoover was kept on the defensive by the Roosevelt strategy of personal attacks and misrepresentations.

But the campaign developed something far more sinister in the evidence that Roosevelt and his Brain Trust were planning a collectivist economy for the United States. Mr. Hoover exposed these plans, but the election favored Roosevelt and he proceeded to put his "planned economy" into effect. Although he had earlier denied its paternity, the depression and all its problems became "his baby," and he nursed it on nostrums during a prolonged infancy of eight years, and finally succeeded in weaning it only on the stimulating diet of the second World War.

One-third of this volume is devoted to the aftermath—the sixth phase of the depression. It reveals the economic fallacies and financial follies of the New Deal, and their impact on American life. Although naturally opposed to the New Deal philosophy,

AEROTURN "ON THE JOB"

. . . gives you

HIGH-EFFICIENCY DUST COLLECTING

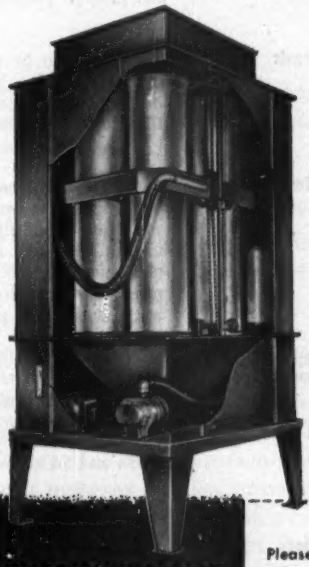
because it has . . .

1 Down-stroke, reverse-air-jet cleaning

2 Automatic pressure-operated control

3 Self-adjusting blow rings

EXCLUSIVE PATENTED FEATURES



Pioneered and developed by Turner & Haws Engineering Company, Incorporated. These high-efficiency AEROTURN features can solve your dust collecting problem. These patented* features guarantee you plus-performance and trouble free operation.

Send today for additional information about AEROTURN dust collectors. Fill in and mail the coupon below.

* Licensed under Hersey patent rights.

TURNER & HAWS
ENGINEERING CO., INC.
87 GARDNER STREET
BOSTON 32, MASS.

Please send me your latest AEROTURN folder by return mail.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

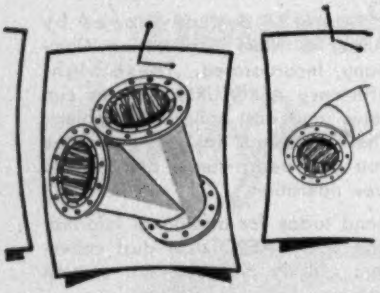
T

and it's as easy as MPC!

MPC Wood-Lined Steel Pipe is the efficient and economical answer wherever corrosion, abrasion, frictional resistance or sliming is a problem.

Ideal for corrosive liquids, gases and fumes including aggressive waters, industrial waste liquors, pulps, slurries, acid, alkali and salt solutions.

For service up to 180° F. and 250 p.s.i. Higher pressure ratings for special service requirements. All pipe flanged and available in 10' and 20' standard lengths or "tailor-made" to your specifications. Easy to cut and reflange. All flanges have standard ASME bolt circle.



Woodlined fittings are available in standard and special designs for all diameters. For catalog and additional information write Dept.

EST. MPC 1869

MICHIGAN PIPE COMPANY

Bay City • Michigan

Manufacturers of Wood-Stave, Saran Rubber-Lined, Stainless Steel and Monel Piping. Represented nationally by Saran Lined Pipe Co. Detroit, (Ferndale) Michigan.

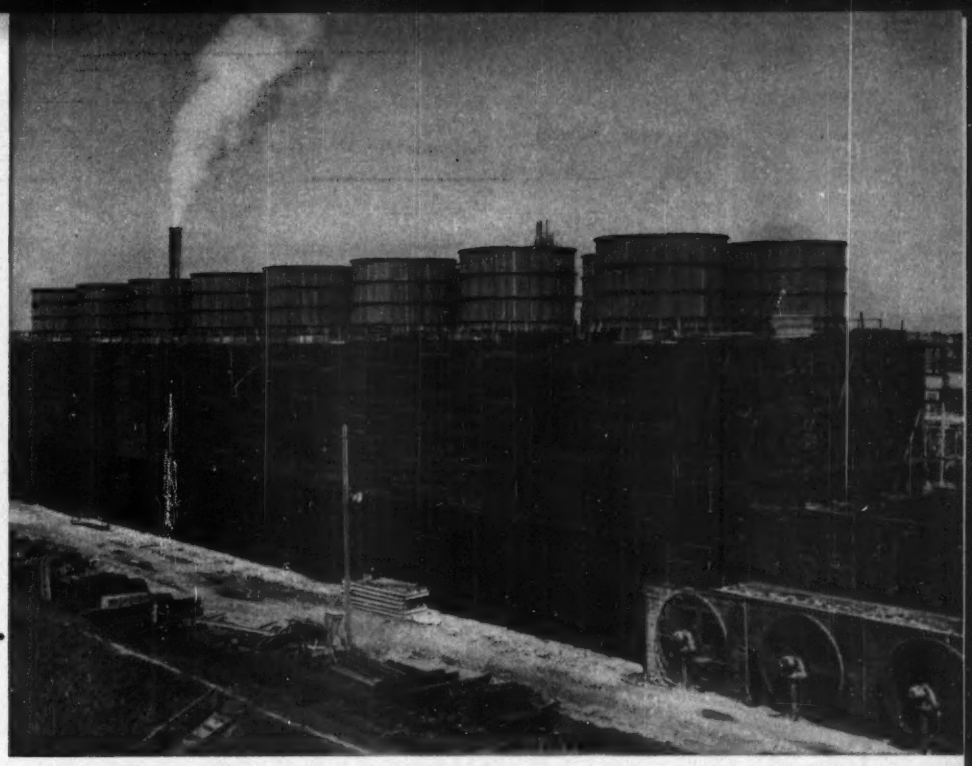
Mr. Hoover offers no personal criticism of Roosevelt. He relies, rather on the opinions of Roosevelt's former associates and colleagues who, in the years of their disillusionment, wrote books in which they repudiated his policies. Notable among these authors are Raymond Moley, John Nance Garner, Cordell Hull, George Creel, Hugh Johnson, and James A. Farley. On the record Mr. Roosevelt is revealed as a man whose sublime egotism and vaulting ambition were matched only by his profound ignorance of economics and finance, his incapacity for organization and management, and his intellectual dishonesty.

Readers of Mr. Hoover's memoirs will be richly rewarded for their time and effort. He stands today a challenging figure in American life, towering above his critics, and giving ample evidence of his wisdom in public affairs. He merits the tribute paid by Garner in his biography: "Today I think Herbert Hoover is the wisest statesman on world affairs in America. He may be on domestic affairs, too."

Recent Books & Pamphlets

Subject	Summary	How to Order
Water	A compendium of existing and potential separation processes, phenomena and energy sources with discussion and literature references. 66 pages.	"Demineralization of Saline Waters." Dept. of the Interior, Washington, D. C.
Productivity	Brief but factually comprehensive record of what the end-results of improved productivity have been, how the fruits have been shared and where the future may carry us. Covers all U. S. manufacturing between 1914 and 1947 with growth and progress projection to 1960. 72 pages.	"Progress in Productivity and Pay." Eddy-Rucker-Nichels Co., Harvard Sq., Cambridge 38, Mass. $2.50.
Cresols	Precautions to be observed in unloading, emptying, handling, storage and disposal of cresols. Health hazards and their control. 16 pages.	Chemical Safety Data Sheet SD-48, Manufacturing Chemists' Assn., 246 Woodward Bldg., 15th and H Sts., N. W., Washington 5, D. C.
Paint	Latest standard specifications for pigments, drying oils, paint driers, and thinners; shellac, varnish and varnish materials; naval stores; lacquer and lacquer materials; traffic paint, bituminous emulsions; paint tests, putty and paint weathering tests. 800 pages.	Eighth edition. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $5.75.
Atomic Energy	The first of a series of periodic supplements to be made to this volume. This one covers papers published in 1949 and 1950. Contains over 8,000 items and an author index.	"An International Bibliography on Atomic Energy." Vol. 2, Scientific Aspects. Supplement No. 1. Columbia University Press, 2960 Broadway, New York 27, N. Y. $3.50.
Safety	How to determine in a practical way the nature and extent of heat stress imposed on workers in industry. Examples of how this means was used to evaluate and control such exposures in the glass industry. 12 pages.	"Industrial Heat Exposures—Evaluation and Control." By George F. Haines, Jr., and T. Hatch. Mellon Institute, 4400 Fifth Ave., Pittsburgh 13, Pa.
Vegetable Oils	For flaxseed and linseed oil: salient economic and statistical information on uses, consumption, U. S. production, imports and exports, and other data pertinent to U. S. needs and supplies. 99 pages.	Industrial Materials Series Report No. M-7. U. S. Tariff Commission, Washington, D. C.

(Continued)



View, showing 16 cells of new Foster Wheeler cooling tower erected on foundation of old tower. Portion of old tower, shown at right, was replaced by 8 cells of new tower.

Tailored to fit customer plant conditions!

THE ERECTION of this new 24-cell cooling tower on the same foundation as the 56-cell tower which required replacement, without interruption in cooling capacity, is another example of the ability of Foster Wheeler to tailor the job to conditions in the customer's plant.

To assure a continuous supply of cooling water while the new tower was being built, 30 cells of the old tower were razed and the remaining 26 cells connected to two smaller existing towers by a temporary flume. The first 16 cells of the new tower were then erected and put into operation in time to meet the oncoming summer heat load. The remainder of the old tower was then removed and the balance of eight new cells erected.

It is through such unusual types of installations that Foster Wheeler has gained the reputation for engineering and construction excellence.

FEATURES OF THIS INSTALLATION:

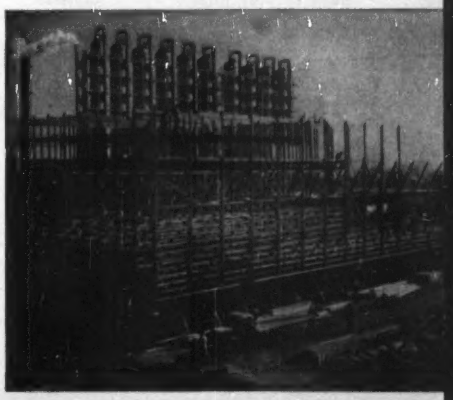
Combination cast iron and red brass distribution system, with 720 special full coverage red brass up-spray nozzles, provides uniform water distribution over a wide variation in water flow rates. Induced-draft fans with 16-foot stacks discharge tower vapors at a high velocity 60 ft. above basin curb—reducing recirculation to a minimum.

The new tower requires 4320 sq. ft. less ground area than the old tower—enough to allow for the addition of four 30 ft. by 36 ft. cells for future requirements.

* * *

DESIGN CONDITIONS

Capacity	48,000 U.S. gpm
Inlet water temperature	120° F
Outlet water temperature	85° F
Wet bulb temperature	80° F



FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, NEW YORK

FOSTER WHEELER

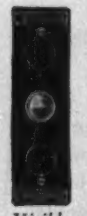
Assures Positive Distance Reading of Liquid Levels

JERGUSON TRUSCALE GAGE

THE modern design JERGUSON TRUSCALE GAGE gives new accuracy for reading of liquid levels in boilers, deaerating tanks, etc.

Here is the remote reading gage which incorporates all of the newest engineering features! The Jerguson Truscale has exceptional sensitivity, with ability to register changes as small as ½ of 1% of range! The translucent dial scale is clearly lighted from behind, and is easy to read.

Available with positive alarm system. Lights and horn signal too high or too low water level.



Visible Alarm

Horn

Available with Repeaters which repeat accurate level readings at auxiliary locations.

Marine Operators: *Special installation procedure compensates for roll and pitch of your ship.*

Repeater

Write for Truscale Catalog

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY

100 Fellsway, Somerville 45, Mass.

Representatives in Major Cities

Phone Listed Under JERGUSON

In Europe: Bailey Meters & Controls, Ltd.

RECENT BOOKS AND PAMPHLETS, cont. . .

Subject	Summary	How to Order
Sanitary Engineering	Analytical report in this field of scientific and technological manpower. Education, experience and supply of sanitary engineers. Based on a survey made by the American Public Health Assn. 36 pages.	"The Composition of the Sanitary Engineering Profession." By Walter A. Lyon and Arthur P. Miller. Scientific Manpower Series No. 2. Supt. of Documents, Washington 25, D. C. 15 cents.
Iodine	Describes the most recent material published on iodine and its many uses. 28 pages.	"Iodine Abstracts and Reviews." Vol. 2, No. 3. Chilean Iodine Educational Bureau, 120 Broadway, New York 5, N. Y.
Pesticides	Lists and abstracts briefly recent patent applications and research papers in this field from the Western and Eastern Zones of Germany and Austria. Translations of all of this material is now available at prices listed. 12 pages.	Bulletin 73. Research Information Service, 53 Nassau St., New York 5, N. Y.
Industrial Hygiene	What the foundation is doing listed under the following categories: chemistry, toxicology; engineering; air pollution; noise; research; legal. 12 pages.	"Activities of Industrial Hygiene Foundation." Mellon Institute, 4400 Fifth Ave., Pittsburgh 13, Pa. Gratis.
National Security	Describes the structure of a civilian association of private citizens set up to cooperate with the ordnance organizations of our Armed Forces. Its constitution, by-laws, organization, membership. 24 pages.	American Ordnance Assn., Mills Bldg., Washington 6, D. C. Gratis.
Midwestern Industry	What the institute is doing to help exploit the industrial potential of the Midwest. 16 pages.	"A Program to Increase Your Business in the Midwest by 10%." Midwest Research Institute, 4049 Pennsylvania Ave., Kansas City, Mo. Gratis.
Analysis	Collected for their use in qualitative analysis: the infrared spectra of 159 pure inorganic compounds (principally salts of polyatomic ions), here presented in both graphical and tabular form; frequencies for 33 polyatomic ions, here in tabular form. 42 pages.	"Infrared Spectra and Characteristic Frequencies of Inorganic Ions." By Foil A. Miller and C. H. Wilkins. Mellon Institute of Industrial Research, 4400 Fifth Ave., Pittsburgh 13, Pa.
Manpower	Summary of a survey on how almost 500 companies employing some 106,000 engineers are making the best use of their engineering staffs. 55 pages.	"How to Improve the Utilization of Engineering Manpower." National Society of Professional Engineers, 1121 15th St., N. W., Washington 5, D. C. $2.
Peppermint Oil	Suggested changes in equipment or operating procedure which are said to (1) reduce the net cost of distilling the peppermint oil by reductions in fuel oil, cooling water, overhead and manpower (2) save peppermint oil which would otherwise be lost during the distillation process. 64 pages.	"Improvements in the Field Distillation of Peppermint Oil." By A. D. Hughes. Oregon State Engineering Experiment Station, Corvallis, Ore. 64 pages.
Molasses	Review of developments in the molasses market since the end of 1951. Price changes, supplies, utilization and prospective demand-supply conditions. 30 pages.	Sugar Report No. 16-M. Dept. of Agriculture, Production and Marketing Administration, Sugar Branch, Washington, D. C.
Gypsum	Its geologic occurrence, mining, preparation and utilization in California. Up to date descriptions of the state's processing plants. Generously illustrated with photographs, maps and tables. 151 pages.	Bulletin 163. W. E. Ver Planck, California Division of Mines, Ferry Bldg., San Francisco 11, Calif.

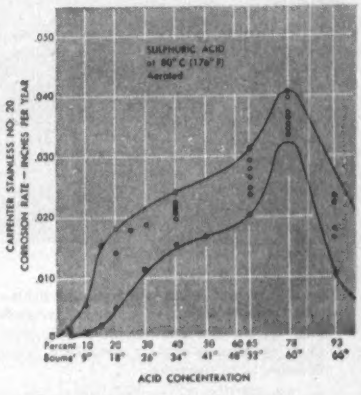
—*End*

Corroded and failed after four days' service
(Unretouched photo)
No apparent corrosion after 256 days of use
(Unretouched photo)

Is the Handling of Corrosive Acids, such as Sulphuric, Causing Headaches in Your Plant?

Today many plants are enjoying new freedom from corrosion, longer equipment life and fewer shutdowns . . . because of Carpenter Stainless No. 20. Take the job shown above. In this application, ½" rd. rods of Carpenter No. 20 and Stainless Type 316 were installed to handle H_2SO_4 at the rate of about 50 gallons a minute in a full range of solution varying from 0% up to 58% concentration. Temperature: 70° C. (158°F.). After four days the Type 316 rods failed and were replaced with ½" sq. No. 20 rods. After being in service 3,747 hours of a possible 6,144 hours over a period of 256 days, the No. 20 rods showed no apparent corrosion whatsoever. (See unretouched photo above.) Of course, Type 316 is satisfactory for certain dilute solutions of H_2SO_4 and many other corrosive conditions. But with a tough problem like the one described here, it takes No. 20 to do the job.

While the production of Stainless No. 20 is controlled by Government Regulations, you may be able to obtain Government approval of its use, depending on the nature of your job. If not, keep these facts in mind because of their importance in your planning for future products. Meantime, write on your Company letterhead for more details in the No. 20 booklet. Also, get in touch with us for No. 20 test coupons. We'll be glad to work with you. The Carpenter Steel Company, 127 W. Bern St., Reading, Pa.

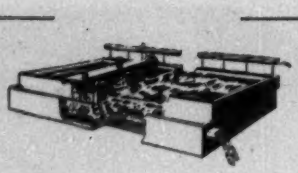


Carpenter STEEL

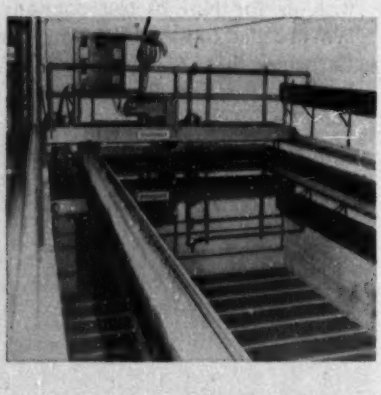
Stainless No. 20

Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U.S.A. and Canada



investigate the
AUTOMATIC BACKWASH RAPID SAND FILTER



Here is a sand filter which cleans itself—automatically—with no interruption whatever to the filtering operation. No shutdown or change-over is necessary while cleaning is in progress.

The secret lies in its special, compartmented filter bed and traveling backwash mechanism which automatically cleans one compartment at a time.

And . . . it's highly efficient, removing 75% to 80% of the suspended solids—90% or better if chemicals are added.

May be used for plant supply water or for waste water treating. Write for Bulletin 48-11.

HARDINGE
COMPANY, INCORPORATED • YORK, PENNSYLVANIA
NEW YORK, CHICAGO, SAN FRANCISCO, TORONTO

CE's Guide to
NEW TECHNICAL LITERATURE

What's New In . . .	How To . . .	Company . . .
Ion Exclusion	. . . separate a nonionic substance from an ionic substance in a solution. Pertinent questions and answers on the new process and examples of its applications. 10 p.	Dow Chemical Co., Midland, Mich.
Dust Control	. . . control and recover industrial dust. Covers five types of equipment made by Dracco for these purposes. Specifications, dimension diagrams, installation photographs. 38 p.	Dracco Corp., Harvard Ave. and East 116th St., Cleveland 5, Ohio.
Instruments	. . . measure directly many unusual process variables where density is a function of the measurement desired. Full description of density gage which uses the penetration power of radioactivity.	Ohmart Corp., 2347 Ferguson Rd., Cincinnati 38, Ohio.
Pumps	. . . choose a pump for just about any type of industrial application. Sectional and exterior views of various types together with selection tables and other data of interest to pump users. Among the pump types featured: portable, high pressure, vertical, split case centrifugal pumps; sump pumps, sewage pumps.	Deming Co., Salem, Ohio.
Feeder	. . . store and feed uniformly any non-free-flowing materials such as wet filter cake, sludges, mastic or plastic-like material or dry solids. Sectional view and installation of this company's Com-Bin Feeder. 4 p.	Pulva Corp., 550 High St., Perth Amboy, N. J.
Instruments	. . . measure and control flow, pressure, liquid level, viscosity and specific gravity. Performance characteristics and schematic diagrams of pneumatic, magnetic, electric, electronic and electronic-follower transmission systems. 20 p.	Fischer & Porter Co., 7250 Jacksonville Rd., Hatboro, Pa.
Teflon Products	. . . combat attack by any known industrial acids or caustics by choosing from a line of Teflon gaskets, rings, sheets, tubes, rods, tape, packings. 8 p.	Raybestos-Manhattan Inc., Packing Div., Manheim, Pa.
Heaters	. . . supply heat to any industrial manufacturing process or machinery requiring temperatures between 212 and 600 deg. F. Describes and illustrates a hot oil heater system. 8 p.	Hot Oil Heater Co., 246 Walnut St., Newtonville 60, Mass.
Powder Fillers	. . . solve dust and density control problems in powder filling with this company's Vacuflow equipment. Photographs, diagrams, specifications. 8 p.	Pneumatic Scale Corp., Ltd., Quincy 71, Mass.
Pumps	. . . handle hydrochloric and other strong acids and corrosive salts by choosing from a line of rubber lined centrifugal chemical and process pumps. Specifications, dimensions, sectional and external views. 4 p.	Warren Steam Pump Co., Warren, Mass.
Plastic Pipe	. . . install, join and get the best advantage of plastic pipe. Detailed tables give chemical and physical characteristics of flexible, semi-rigid, rigid high impact and rigid polyvinyl chloride pipe. 16 p.	Triangle Conduit and Cable Co., Plastic Products Div., New Brunswick, N. J.
Compressors	. . . keep lubricating oil from contaminating compressed air, such as in instrument control, food processing, breweries and distilleries—by choosing from a line of oil-free air compressors. 4 p.	Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Separator	. . . obtain continuous, clean and accurate separations of any type of screenable material with a mechanism for wet or dry screening. 8 p.	Southwestern Engineering Co., 4800 Santa Fe Ave., Los Angeles 58, Calif.
Nitrogen Compounds	. . . evaluate, apply and handle any one of 35 commercially available aliphatic nitrogen compounds. Physical property charts. 44 p.	Carbide and Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y.
Flotation Reagents	. . . avail yourself of the most recent Cyanamid developments in the field of flotation. New and improved reagents, machines and processes are described both in the metallic and non-metallic fields. 44 p.	American Cyanamid Co., Mineral Dressing Div., 30 Rockefeller Plaza, New York 20, N. Y.
Instruments	. . . perform exacting tasks of measurement and control of liquids and gases for the process industries with this company's line of controllers, gages, manometers, valves, venturi tubes. Operating characteristics, construction details, mountings, specifications. 32 p.	Simplex Valve & Meter Co., 68th and Upland Sts., Philadelphia 42, Pa.
Gear Reducers	. . . get engineering data and prices to assist in selection of the proper gear reducer for your specific power transmission problem. Catalog has three subdivisions: motorized gear speed reducers; motor reducers, a packaged unit assembled on base plate with coupling; gear speed reducers, the basic reducer used in these two previously mentioned types. 88 p.	D. O. James Gear Mfg. Co., 1140 West Monroe St., Chicago, Ill.

PRODUCT CONTROL THROUGH INFRARED ANALYSIS

Number 8 *of a Series of Data Sheets for Better Process Control from The Perkin-Elmer Corporation, Manufacturers of Infrared Spectrometers, Flame Photometers and Electro-optical Instruments.*

PROBLEM:

Analysis of mixtures containing five different C_{10} aromatics.

PLANT:

Developed by Monsanto Chemical Co., Texas City, Texas.

SOLUTION:

Infrared Analysis—Method is briefly as follows:

Point readings taken at five analytical absorption bands and at three wavelengths characterized by low absorbancy for all components and by relative nearness to the analytical wavelengths to cancel out absorbance of the cell. The results are calculated according to Formula 1, right.

INSTRUMENTATION:

Perkin-Elmer Model 12-C Spectrometer, rock salt optics.

DISCUSSION:

Other methods of analysis proved to be either too difficult or time consuming. The infrared analysis was designed to be rapid and accurate with maximum simplicity of execution.

Complete analysis including computation for the five components can be done in about 45 minutes with an average absolute error of 0.5%, comparing favorably with similar reported work.

REFERENCE:

Anal. Chem., 23, 3, (1951).

Formula 1

$$A = \log \frac{I_0}{I} = K\,cd$$

Where A = absorbancy
K = absorbancy coefficient
c = concentration
d = cell length
I_0 = intensity of incident radiation
I = intensity of transmitted radiation

Model 12-C Spectrometer at Monsanto's Texas City plant.

Let us discuss your Product Control Problems with you. Write The Perkin-Elmer Corp., Dept. 33, Norwalk, Conn.

Southern Office: Lee Circle Bldg., New Orleans, La.

PERKIN ELMER

ARE YOU RECEIVING INSTRUMENT NEWS?

This 8-page quarterly brings you the latest developments in electro-optical instrumentation as well as their application to research and process control.

for PUMPING CHEMICAL SOLUTIONS!

Fig. 19,447

NO LEAKAGE at STUFFING BOX

VERTICAL DESIGN

Taber vertical pumps are specially built for handling chemical solutions, efficiently and economically . . . in the processing industries. Vertical design permits locating stuffing box above and out of liquid level. Therefore nothing to leak.

On business stationery, we suggest you write for:

BULLETIN V-837

TABER PUMP CO. Est. 1859
294 ELM ST., BUFFALO 3, N. Y.

New Technical Literature, cont. . .

What's New In . . .	How to . . .	Company . . .
Control Panels	. . . get ideas for planning control stations. Numerous panel designs, fashioned for control, are illustrated along with the most up-to-date methods of tubing and wiring. 8 p.	Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.
Aniline	. . . find more applications of aniline by studying its current uses and long history. 12 p.	National Aniline Div., 40 Rector St., New York 6, N. Y.
Ethanolamines	. . . appraise the potential of the ethanolamines. Chemical, physical and pysiological properties; shipping data; and applications in all branches of manufacturing and processing industries. 4 p.	Carbide and Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y.
Nozzles	. . . select the correct nozzle for use in operations where liquids are used in the form of sprays. Dimension tables, capacity charts, cross-sectional drawings. 20 p.	Schutte and Koerting Co., Cornwells Hts., Bucks County, Pa.
Autoclaves	. . . fill your requirement for autoclaves, reactors, high pressure valves and fittings. Describes and illustrates about 150 items for high pressure laboratory work. 52 p.	Autoclave Engineers, Inc., 860 East 19th St., Erie, Pa.
Fungicides	. . . choose the proper paint formulation from the standpoint of mildew resistance. Characteristics, uses, effectiveness, advantages of a line of paint fungicide. 12 p.	Nuodex Products Co., Elizabeth F, N. J.
Dibutyl Adipate	. . . impart low-temperature flexibility and water resistance, through the use of dibutyl adipate, to polyvinyl chloride, polyvinyl chloride acetate, ethyl cellulose, cellulose nitrate, polystyrene and synthetic rubbers. 2 p.	Witco Chemical Co., 295 Madison Ave., New York 17, N. Y.
Pumps	. . . supply yourself with pumps, with 7 to 28 gal.-per-min. capacity, for lube, vegetable or paint oils, sirups, thinners, solvents, and industrial liquids from drums, wheel tanks or underground storage. 6 p.	Blackmer Pump Co., 1809 Century Ave., Grand Rapids 9, Mich.
Speed Reducers	. . . evaluate a line of motorized worm gear speed reducers made for horizontal or vertical drives from ⅛ to 30 hp. Sectional view, tables giving fractional and integral hp., dimensions and weights. 48 p.	D. O. James Gear Mfg. Co., 1140 West Monroe St., Chicago, Ill.
Plastics	. . . put to best use various types of optically clear rigid plastic sheets. Describes the uses of a hard thermally set plastic featuring resistance to abrasion, heat and solvents; an inexpensive easily heat formed thermoplastic; an allyl based resin notable for its ability to be heat formed to radical shapes and curves; a high heat resistant insulating plastic for use at ultra-high frequencies. 8 p.	Cast Optics Corp., 1 Post Rd., Riverside, Conn.
Insulation	. . . provide thin, insulated walls for your boilers, refinery heaters, dryer furnaces and cement kilns. Photos and engineering drawings. 12 p.	Bigelow-Liptak Corp., 2550 West Grand Blvd., Detroit 8, Mich.
Couplings	. . . find hose couplings and fittings which are coupled and uncoupled in half a second or less and work equally well on air, water, gas, oil, hydraulic or steam lines. 8 p.	Hose Accessories Co., 2704 North 17th St., Philadelphia 32, Pa.
Glycols	. . . use the water-soluble liquid and solid polyethylene glycols and the methoxy polyethylene glycols, and the methoxy polyethylene glycols in the rubber, pharmaceutical, textile, metal, agricultural, printing petroleum and electronics industries. 48 p.	Carbide and Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y.
Stearates	. . . straighten yourself out as to the uses and properties of a line of stearates including aluminum, cadmium, calcium, lead, lithium, magnesium, sodium and zinc. 32 p.	Witco Chemical Co., 295 Madison Ave., New York 17, N. Y.
Special Chemicals	. . . find special, rare and reagent chemicals. List of 1,000 of those available from this company, and their price. 8 p.	Jasonols Chemical Corp., 1085-87 Myrtle Ave., Brooklyn 6, N. Y.
Steel	. . . make comparisons of the different types of hot rolled and cold finished carbon and alloy steel bars. Characteristics, mechanical properties and uses are listed. 4 p.	Joseph T. Ryerson & Son, Box 8000-A, Chicago 80, Ill.
Separator	. . . separate dry granular products into predetermined grades with an all metal sifter which uses a gyratory screening motion. Dimensions, capacity curves and screen specification mesh comparisons. 12 p.	Allis-Chalmers Mfg. Co., 1147 South 70th St., Milwaukee, Wis.
Phenol	. . . make phenol. An article on the various processes in use and an economic study of the product. 6 p.	John M. Weiss and Co., 50 East 41st St., New York 17, N. Y.
Wood	produce more chemicals from wood, such as sugar, glycols, phenols, automotive and industrial fuels. Discussion of this and other projects that could be undertaken by the lumber industry to relieve some of its problems. 32 p.	Timber Engineering Co., 1319 18th St., N.W., Washington 6, D. C.

HAPMAN REPRESENTATIVES LOCATED IN ALL PRINCIPAL CITIES

HAPMAN CONVEYORS, INC.

DIVISION OF HAPMAN-DUTTON COMPANY

604 GIBSON ST., KALAMAZOO, MICHIGAN

Hapman PATENTED CONVEYORS

Hapman Tubular Conveyors Move Almost Any Flowable Material— Wet or Dry—Through Any Plane or Angle

WHAT THEY ARE:

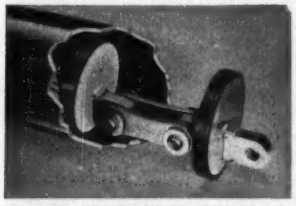
Hapman Conveyors consist of solid circular flights of Neoprene (or special materials), mounted at intervals on special, sealed-pin chain or wire cable operating within standard pipe or tubes.

WHAT THEY DO:

They move almost any powdered, granular and semi-liquid material at speeds up to 100 feet per minute—in single runs up to 300 feet long—through any plane or angle—with minimum clearance and outside support.

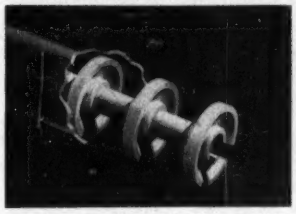
HOW THEY'RE APPLIED

Often they're used where sanitation is vital. They are dust proof, liquid-tight, odor-confining, self-cleaning. For carrying corrosive and non-corrosive chemicals, foodstuffs, abrasives, sludges.



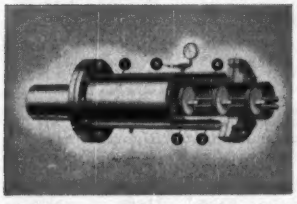
Rubber flights move dozens of materials through standard pipe.

HAPMAN SEALED-PIN CHAIN CONVEYOR—Incorporates compressed synthetic rubber washers to seal link-pins from abrasion of conveyed materials. Flexible chain twists to follow bends in pipe. Circular flights are usually of abrasive-resistant synthetic rubber, bonded between steel plates, with rigid, sanitary surfaces. For high temperature or corrosive conditions, flights may be cast iron, stainless steel, fibre, etc. Hapman Vibrators assure discharge of powdered materials. Conveyors are quiet, self-cleaning. Power consumed is low.



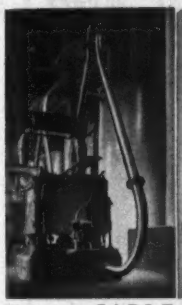
Flight flanges interlock, covering wire cable.

HAPMAN CABLE-VEYOR—Developed particularly for handling certain foods and chemicals. Consists of regularly spaced circular flights mounted on sheave-driven wire cable. Flights are convex, with extended flanges which interlock with flanges ahead and behind, providing continuous cover for the cable. Oversize flights with flexible edges may be mounted at intervals to clean the inside surface of tube. Synthetic rubber or plastics are usually specified for flights, depending upon the application.

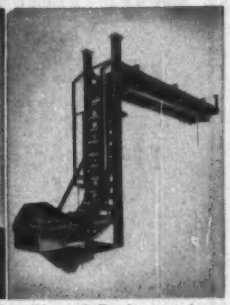


Permits processing under vacuum or pressure while "on the move."

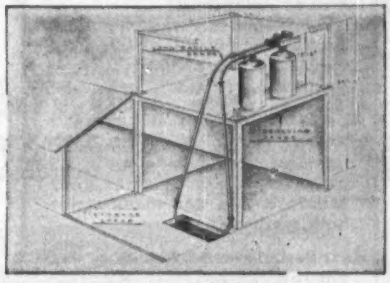
HAPMAN PNEUMATROL SECTIONS—May be included in conveyor to permit **continuous, simultaneous feeding and processing** of flowable materials **under pressure or vacuum.** Two Pneumatrol sections required to confine pressure or vacuum to one part of conveyor.



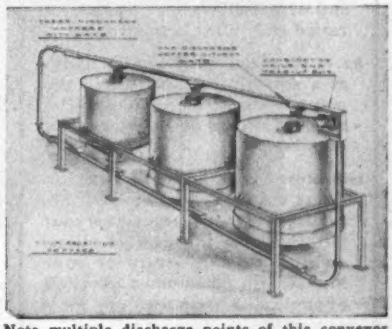
Hapman CABLE-VEYOR can be used on food processing equipment. Flour is carried to this bakery unit.



Pivoted Bucket carrier —various layouts possible — for handling fragile materials, crystalline, etc.



Hapman Conveyor feeds into tanks for processing.



Note multiple discharge points of this conveyor for abrasive material.

YOU CAN HANDLE ALL THESE MATERIALS AND MANY MORE:

Bulk Chemicals: Powdered, granular, crystalline, semi-liquids—at high or low temperatures. Corrosives or other Radioactive wastes. Pharmaceuticals.

Powdered Material:
Baking flour
Starch
Powdered sugar
Resins
Talc
Coal
Malt

Abrasive Dusts:
Clay
Aluminum Oxide
Foundry Sand
Emery dust
Ceramic powder
Cupola slag
Cast iron dust

Sludges from:
Settling tanks
Quench tank scale
Spent grains and hops (Breweries)
Processing vats

HAPMAN ENGINEERING SERVICE AND TEST EQUIPMENT AVAILABLE

Test Conveyors are available at the factory or for shipment to your plant, in case unusual conditions actually require "on the spot" testing of your material. Hapman Conveyors are individually engineered to your job. Send details of your problem to Hapman for analysis and estimates by experienced engineers. Write for complete catalog.

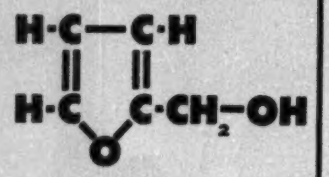
THESE INSTALLATIONS MAY SUGGEST SOLUTIONS FOR YOUR BULK HANDLING AND FEEDING PROBLEMS:

(Scores of other materials successfully handled.)

American Cyanamid Co..Sodium Chloride
Dow Chemical.....Pressurized Feeders
Upjohn Company.....Powdered Clays
Lever Brothers.....Rinso Soap Powder
Shell Oil Company.....Spent Filter Clay
Crown Cork & Seal Co.....Ground Cork
Stroh Brewery.....Wet Spent Grain
Helms Bakeries.....Flour Handling
Goodyear Tire and Rubber Co....Carbon Black
Johnson and Johnson.....Talc Handling
Centilivre Brewing Co....Malt and Grain

FA*

will help you



Furfuryl Alcohol

Solvent, Resin Former, Wetting Agent

DESCRIPTION:
Amber-colored liquid.

Properties:

Boiling Point (pure) °C. 764 mm.	175-7
Specific Gravity (20/20°C.).	1.136
Flash Point (open cup) °C..	75
Vapor Pressure 55.5°C.,mm.	5.5

As a Solvent: FA is miscible with water, chloroform, ether, coal tar solvents, and non-paraffinic hydrocarbon solvents; dissolves nitrocellulose, dyes and many resins, both synthetic and natural.

As a Resin Former: FA reacts with phenolic compounds, formaldehyde, melamine, urea, thiocyanates and with itself, to form resins with varied and valuable properties.

As a Wetting Agent: FA is useful as a solvent and wettant in the manufacture of resin-bonded abrasive wheels and cold molded plastics.

Literature: Data Sheets, a Reaction Chart, and Technical Bulletins are available to you. A request on your letterhead to the nearest office, mentioning the nature of your interest will bring you a selection of applicable literature.

*Reg. U.S. Pat. Off.

The Quaker Oats Company

CHEMICALS DEPARTMENT

335M The Merchandise Mart
Chicago 54, Illinois
Room 535M, 120 Wall St.,
New York 5, N. Y.
Room 435M, P. O. Box 4376
Portland 8, Oregon

In San Francisco: The Griffin Chemical Company

In Europe: Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A., 3, Rue Pillet-Will, Paris IX, France

In Australia: Swift & Company, Pty. Ltd., Sydney

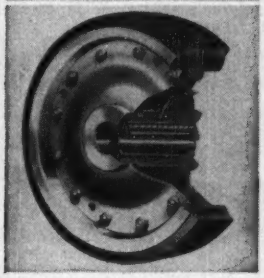
In Japan: F. Kanematsu & Co., Ltd., Tokyo

What's New In . . .	How to . . .	Company . . .
Resins	. . . evaluate this company's Darex 43G in gum formula and comparison with competitive resins. 4 p.	Dewey and Almy Chemical Co., Cambridge, Mass.
Pipe	. . . speed installation of pipe and fittings in your piping systems. Tables of standard sizes for pipe and fittings, flexible couplings, connectors, parts and accessories, centrifugal pumps and globe valves. Chart of do's and don't's of installation practices.	National Carbon Co., 30 East 42nd St., New York 17, N. Y.
Chemicals	. . . choose reagent grade acetic, hydrochloric, nitric and sulphuric acids and ammonium hydroxide. Five bulletins. Specifications, common uses and handling precautions.	J. T. Baker Chemical Co., Phillipsburg, N. J.
Paint	. . . use this company's corrosion resistant paint and primer. Chemical resistance charts. 16 p.	U. S. Stoneware Co., Akron 9, Ohio.
Fittings	. . . transport viscous or high melting point materials quickly and efficiently. Fittings available in high grade cast iron or special corrosive resistant alloys. 8 p.	Parks-Cramer Co., Fitchburg, Mass.
Hydrogen Peroxide	. . . treat cellulose and cellulose derivatives with peroxygen compounds. 11 p.	Buffalo Electro-Chemical Co., Station B, Buffalo 7, N. Y.
Instruments	. . . use a corrosion resistant stainless steel industrial meter to handle corrosive liquids common to the cellulose, chemical, confectionery, food, oils and fats, rubber and other process industries. Specifications, dimensions.	Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa.
Precipitator	. . . reduce time and costs in handling precipitated material with a new electrostatic unit which features a wet-bottom design. 4 p.	Research Corp., 405 Lexington Ave., New York 17, N. Y.
Filters	. . . solve your liquid handling problems by choosing from this company's comprehensive line which covers a wide range of applications in the chemical industry. 16 p.	Ertel Engineering Corp., Kingston 8, N. Y.
Conveyor	. . . transport paper, cloth or burlap bags from filling and weighing equipment through bag-closing operations with a specially-designed V-belt conveyor. Photographs and engineers' drawings. 4 p.	Richardson Scale Co., Clifton, N. J.
Materials Handling	. . . simplify car loading and truck loading operations with magnesium ramps. 2 p.	Penco Engineering Co., 25 California St., San Francisco 11, Calif.
Instruments	. . . apply time-cycle controllers in the manufacture of rubber goods, molded plastics, dry ice, tires, rayon. 12 p.	Bristol Co., Waterbury 20, Conn.
Safety	. . . choose a gas mask for protection under a variety of dangerous conditions. 2 p.	Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn 17, N. Y.
Wire Cloth	. . . meet your needs for woven wire conveyor belts, slings, special metal fabrications and industrial wire cloth. 4 p.	Cambridge Wire Cloth Co., Cambridge, Md.
Process Equipment	. . . assure yourself of chemical-proof construction by taking advantage of the fabrication and lining facilities of this company. 4 p.	Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio.
Analysis	. . . accurately determine hardness, iron, phenolphthalein and methyl orange alkalinity, chloride and pH with drop-count water testing kits which are described. 20 p.	Hach Chemical Co., Ames, Iowa
Surfacing Material	. . . combat corrosion less expensively with a surfacing material which is chemically equal to acid proof brick in many applications. 6 p.	Ceilcote Co., 4832 Ridge Rd., Cleveland 9, Ohio.
Ethylbenzene	. . . size up ethylbenzene for your own possible use. Chemical, physical and reaction data. Suggested uses in the manufacture of organic compounds, dye intermediates and pharmaceuticals, styrene monomer and chlorostyrene and as a solvent. 12 p.	Monsanto Chemical Co., Texas Div., Texas City, Tex.
Boiler Plants	. . . supply yourself with the right steam boiler plant for any one of a number of applications. 8 p.	Eclipse Fuel Engineering Co., Rockford, Ill.
Tubing	. . . get a better understanding of the advantages of stainless tubing and pipe. Photographs show manufacturing procedure from forming and welding to final inspection. Sizes are listed in chart form. 8 p.	Damascus Tube Co., Greenville, Pa.

For Savings Specify

DARNELL

Casters & Wheels



Whether for light, medium or heavy duty use, Darnell Casters and Wheels are built to take punishment.

KEEP TURNING AND EARNING

Built-in quality assures a long life of efficient service—it pays to "Demand Darnell Dependability".

Free

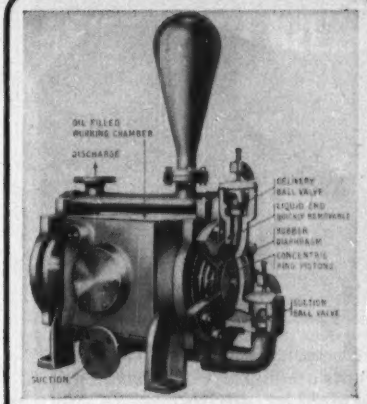
MANUAL

DARNELL CORP., LTD.
DOWNEY, (Los Angeles County) CALIF.

60 Walker Street, New York 13, N.Y.
36 North Clinton, Chicago 6, Illinois

Your Best Bet for Those Tough-to-Pump Materials

- ✓ POSITIVE DOUBLE ACTING
- ✓ NO PACKINGS • NO LEAKAGE
- ✓ NO CONTACT BETWEEN FLUID HANDLED AND WORKING PARTS
- ✓ EASY TO CLEAN
- ✓ LOW COST MAINTENANCE
- ✓ MADE OF ANY MATERIAL
- ✓ AMPLE PRESSURE



Details of one liquid end. Mechanical parts are completely separated from the fluid handled by rubber diaphragms.

Here's the ideal pump for corrosive, abrasive, viscous, thick, heavy, delicate or hazardous materials or fluids which clog or build up on pump parts. Economical—low maintenance—truly the pump that "can take it."

Write for Bulletin 126

Shriver Diaphragm Pumps

T. SHRIVER & COMPANY, Inc., 802 Hamilton Street, Harrison, N.J.

FOR EFFECTIVE SPRAYING AT LOWER COST

remember final control is the SPRAY NOZZLE you use!

In design . . . choose the Spray Nozzles that give you proper performance, with exact spray pattern, impact, spray angle and capacity. In application . . . be sure the nozzles as supplied are produced to close tolerances. Metallurgically, make certain the spray nozzles fit your use.

With Spraying Systems you can be sure of spray nozzles to meet all three requirements. *Let Spraying Systems Co. recommend Spray Nozzles to meet your needs best.*

YOUR GUIDE TO SPRAY NOZZLE SELECTION
Spraying Systems Co. Catalog No. 22 . . . 32 pages, with complete performance data. Also write for Catalog 23 . . . Pneumatic Atomizing Nozzles.

SPRAYING SYSTEMS CO.
3275 RANDOLPH STREET • BELLWOOD, ILLINOIS

FOR EFFICIENT SPRAYING MAKE SURE THE NOZZLE IS RIGHT

'Surface Burners

70 Types—700 Sizes!

America's foremost chemical plants use 'Surface' industrial gas burners by the thousands, for making petrochemicals, synthesis gas, pharmaceuticals, pulp and paper . . . their applications are endless.

Surface Combustion industrial gas burners are selected for:

1. *Flexibility*—wide range of turn-down.
2. *Operating efficiency.*
3. *High or low pressure*—fuels at all pressures can be used.
4. *Versatility*—efficient with a wide range of gases including manufactured gas, natural gas, propane and butane.
5. *Constant flame control*—essential in chemical plant processes.

Selection of these burners is another instance of Surface Combustion's acceptance by the chemical process industry. With 70 types of gas burners in 700 sizes, 'Surface' can meet your burner requirements.

SURFACE COMBUSTION
Corporation
TOLEDO 1, OHIO

'Surface'
'Kathabar'
'Janitrol'

CE-9H
Send me specifications on Gas Burners
for.....
.....
Name.....
Position.....
Company.....
Address.....
City.....Zone....State.....

NEW TECHNICAL LITERATURE, *cont. . .*

What's New In . . .	How To . . .	Company . . .
Instruments	. . . use the mass spectrometer for control analyses, complex mixture analyses, exploratory analyses, purity determinations. Charts show performance characteristics. Accessories, specifications. 20 p.	Consolidated Engineering Corp., 300 North Sierra Madre Villa, Pasadena 15, Calif.
Heaters	. . . select the proper unit for any particular application to high or low pressure heating, power or process steam. Fully labeled cutaway view. Ratings, data and dimensions. 14 p.	Kewanee-Ross Corp., Kewanee, Ill.
Pumps	. . . supply your plant with the right type of pumps for handling gasoline, diesel fuel, crude oil, L-P gases, ammonia and other volatile liquids. 6 p.	Johnston Pump Co., 3272 East Foothill Blvd., Pasadena 8, Calif.
Rubber	. . . take advantage of a special form of natural rubber manufactured in Malaya said to have greater resistance to abrasion, corrosion and vibration than metal or any other type of rubber or plastic. 4 p.	Linatex Corp. of America, Rockville, Conn.
Equipment	. . . supply equipment for jobs where materials must be moved or power transmitted mechanically. Pictures the complete line of products and their applications in various industries. 48 p.	Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Separators	. . . make mechanical separators save money for your plant by cleaning up steam, vapor, compressed air and gases by removing 99 percent of dirts, solids, moisture, and other objectionable entrainment. Drawings, selection tables, dimensions, capacities and prices. 8 p.	V. D. Anderson Co., 1935 West 96th St., Cleveland 2, Ohio.
Diesels	. . . use a small light weight Diesel yet get the operating economy, stability and long life of a big engine. Sectional wash drawings, installation views and diagrams. Specifications, weights, performance curves, dimension tables. 12 p.	Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Chain	. . . evaluate 22 stock sizes of detachable chain of hook and bar construction formed from strip steel by progressive dies. Specifications for all chains and attachments. Suggestions for use in drive and conveyor service. 16 p.	Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Lubricants	. . . avoid seizing and galling wherever bearing pressures and temperatures are beyond the capacity of conventional lubricants through the use of lubricants based on highly concentrated and purified molybdenum disulphide. 8 p.	Alpha Corp., 179 Hamilton Ave., Greenwich, Conn.
Testing	. . . take advantage of services available for the quality control of many products. Facilities that make it possible to perform: nondestructive testing, testing for performance, corrosion resistance, protective coatings, chemical analysis, development of specifications. 4 p.	American Standard's Testing Bureau, Inc., 44 Trinity Place, New York, N. Y.
Instruments	. . . meet special problems arising in many industrial plants with this company's pneumatic positioning operator and flow meter. A bulletin on each. 4 p. ea.	Republic Flow Meters Co., 2240 Diversey Pkwy., Chicago 47, Ill.
Carbon Black	. . . properly employ its unique physical and chemical properties for the most profitable use. Data in chart form. 4 p.	Binney & Smith Co., 41 East 42nd St., New York 17, N. Y.
Valves	. . . make the proper selection from a line of boiler water feeders, low water fuel cut-offs, pump controls and relief valves. Specifications and applications of various models. 8 p.	McDonnell & Miller, Inc., 3500 North Spaulding Ave., Chicago 18, Ill.
Instruments	. . . make the best use of packless-flexible-shaft-type liquid-level controllers. Operating and dimension diagrams, photographs of various models. 12 p.	Moore Products Co., H & Lycoming Sts., Philadelphia 24, Pa.
Instruments	. . . find a product to solve the ever advancing problems of radiation protection. Function and photographs of such products as processing tank combinations, through-the-wall processing systems, special tanks, water coolers, etc. 72 p.	Bar-Ray Products, Inc., 209 25th St., Brooklyn, N. Y.
Reforming Plant	. . . process industrial hydrocarbons to produce a variety of products including pure hydrogen, synthesis gases, fuel gases. Foldout flowsheets show how the process is being operated by this company. 14 p.	Power-Gas Corp. Ltd., Stockton-on-Tees, England.
Filing Efficiency	. . . simplify identification of compounds by means of mass spectra by using cards which mechanize the process of comparing recorded spectra with known mass spectral data.	Consolidated Engineering Corp., 300 North Sierra Madre Villa, Pasadena 8, Calif.

Free Data File...

Beckman application data

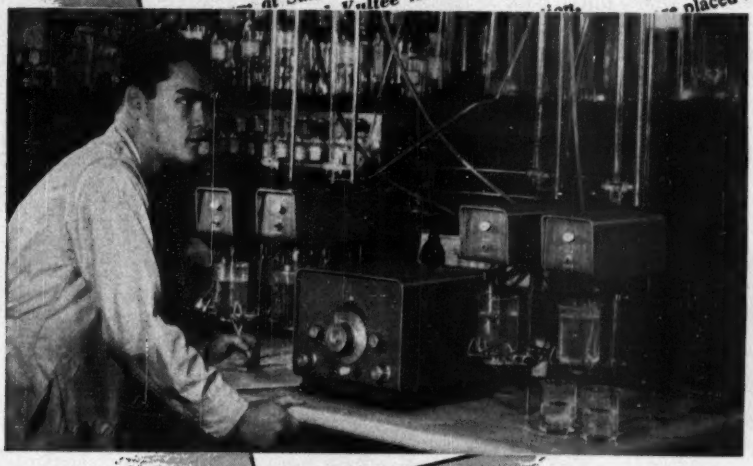
Beckman Automatic Titrator Improves Accuracy—Simplifies Chromium Titrations for Consolidated Vultee Aircraft

PROBLEM

More accurate determination of chromium in low alloy steel containing chromium, manganese and molybdenum at San Diego, California plant of Vultee Aircraft Corpora-

SOLUTION

The Beckman A
mounted on a p
room and elect
vide readings
from the follo
pH Indicato
in the centre
placed



For information on the Automatic Titrator and the above application see your Beckman Dealer, or Write For Data File 43-14

HOW YOU CAN USE THE BECKMAN AUTOMATIC TITRATOR!

The Beckman Automatic Titrator performs accurate potentiometric titrations (neutralization, oxidation-reduction, precipitation and complex-formation types) with average time of 2 minutes—accuracy to 0.1%. Greater speed and accuracy than indicator methods and no special skill required.

BECKMAN INSTRUMENTS control modern industries

BECKMAN INSTRUMENTS, INC.

SOUTH PASADENA 1, CALIFORNIA

Factory Service Branches: New York—Chicago—Los Angeles

Beckman Instruments include: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments

FOR MEN WHO USE WIRE MESH BELTS!

HERE'S WHY LEADING MANUFACTURERS SPECIFY "CAMBRIDGE" WIRE MESH CONVEYOR BELTS.

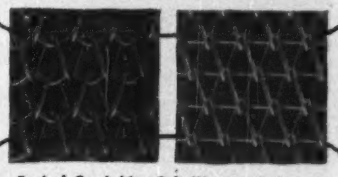
ACCURATE CONSTRUCTION—every step of the construction of your belt is carefully controlled so that the finished belt meets specifications for size, mesh count and mesh opening. Even the welds at the edge of the belt are specially inspected to give you maximum protection at this most vulnerable part of the belt.

RANGE OF SPECIFICATIONS—whether you're handling delicate lightweight loads, such as synthetic fibres, or heavy, bulky loads such as bagged cement, there's a Cambridge wire belt specification to meet your needs. Even processing through heat, cold or corrosive solutions is a snap when the proper metal or alloy is chosen for fabricating your belt.

EXPERIENCED ENGINEERING SERVICE—the combination of trained engineers both in the Cambridge plant and on our Sales Staff is your assurance that the belt recommended for you is the right belt. Cambridge engineers can assist you in any phase of conveyor belt usage . . . conveyor design, plant layout, equipment specifications, etc.

P. S.

IF YOU DON'T USE WIRE MESH BELTS, you'll do well to find out how they can cut costs and boost output by combining product movement with processing in your plant. For information write direct or call in your Cambridge field engineer. Look under "Belting-Mechanical" in your classified telephone directory for the Cambridge man nearest you.



Typical Cambridge Belt Weaves, Balanced and Rod-Reinforced, are widely used for many processes which can be combined with movement. Other Weaves available.

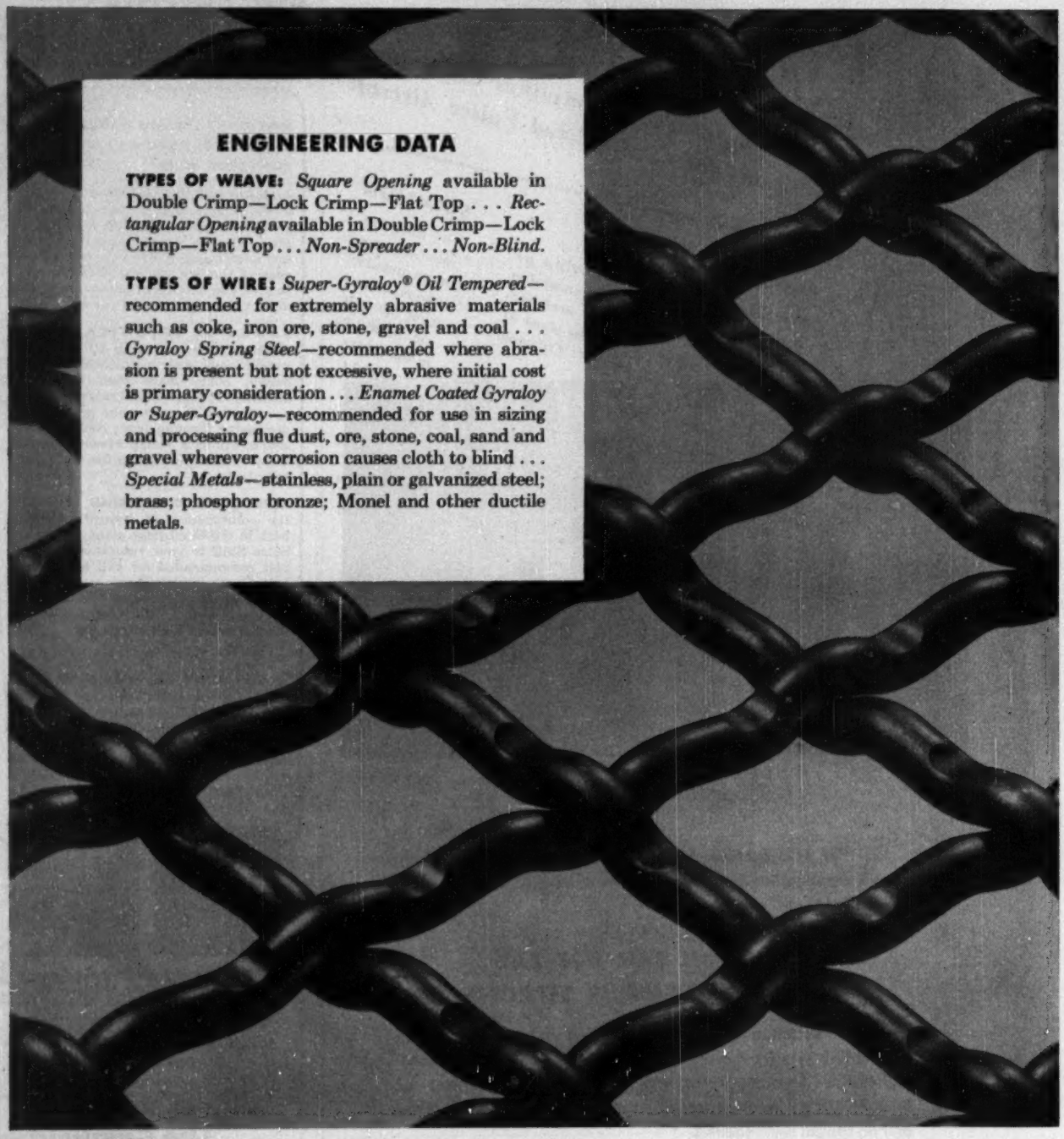
FREE WIRE BELT MANUAL
Gives data on design, installations, construction. Write for your copy now.

The Cambridge Wire Cloth Co.
Dept. G • Cambridge 2, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

We'll Give You Better



ENGINEERING DATA

TYPES OF WEAVE: *Square Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Rectangular Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Non-Spreader* . . . *Non-Blind.*

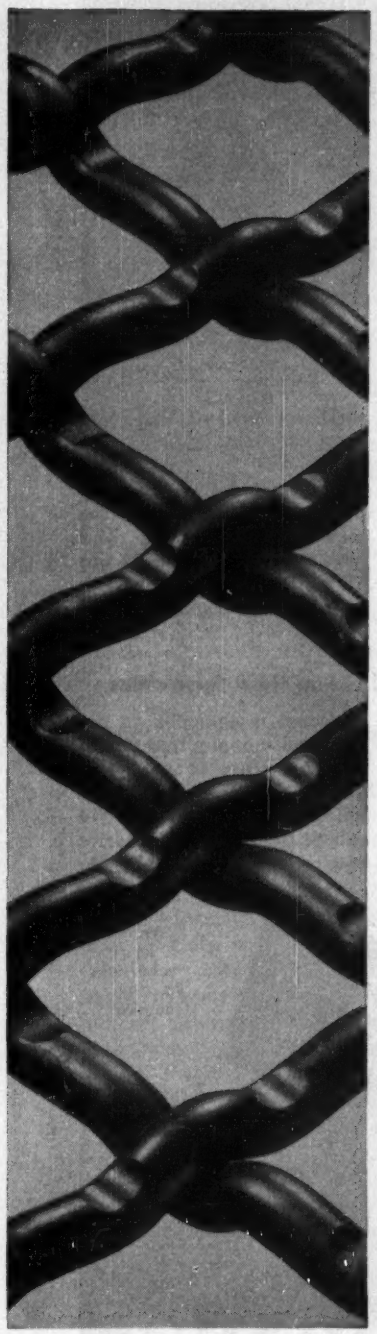
TYPES OF WIRE: *Super-Gyraloy® Oil Tempered*—recommended for extremely abrasive materials such as coke, iron ore, stone, gravel and coal . . . *Gyraloy Spring Steel*—recommended where abrasion is present but not excessive, where initial cost is primary consideration . . . *Enamel Coated Gyraloy or Super-Gyraloy*—recommended for use in sizing and processing flue dust, ore, stone, coal, sand and gravel wherever corrosion causes cloth to blind . . . *Special Metals*—stainless, plain or galvanized steel; brass; phosphor bronze; Monel and other ductile metals.

HEWITT-ROBINS INCORPORATED

HEWITT-ROBINS

DIVISIONS: HEWITT RUBBER • ROBINS CONVEYORS • ROBINS ENGINEERS • RESTFOAM®

Screen Cloth Delivery



Increased Production Capacity Assures Faster Delivery For All Types Of Hewitt-Robins Screen Cloth

Now, we can give you faster delivery—*direct from our own modern plant*—of the finest quality screen cloth to meet your every need . . . Screen Cloth that gives you longer life, greater satisfaction on any type of screen, regardless of make . . . Screen Cloth that will provide you with highest efficiency, lowest cost per ton.

For shorter delivery on any type of Hewitt-Robins screen cloth send us this information:

1. Type of screen—Name of manufacturer—Model of machine.

2. Kind of screen cloth desired: Specify type *weave*—type of *wire*.

3. Size of clear opening or mesh and wire diameter.

4. Type of edge formation: Flat edges — Welded — Reinforced hook strips.

5. Length and width of panels (width measured from outside to outside of bent hooks)—Height and length of hook strips—Degree of angle inside of hook.

6. For rectangular, non-spreader or non-blind openings: Specify direction of long slot (which dimension of cloth it parallels).

7. For dewatering decks: Size of openings in mm—Single, double or no depressions—Round or triangular profile stainless steel rods.

WRITE FOR SCREEN CLOTH BULLETIN No. 113-A1

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR OPERATION

CONVEYORS:
- ☐ —Belt
- ☐ —Sectional
- ☐ —Vibrating

BELTING:
- *☐ —Elevator
- *☐ —General Conveyor
- *☐ —Hot Materials
- *☐ —Rayon
- ☐ —Woven Wire
- ☐ BUCKET ELEVATORS
- ☐ IDLERS

SCREEN CLOTH:
- ☐ —Electrically Heated
- ☐ —General

VIBRATING SCREENS:
- ☐ —Dewaterizers
- ☐ —General
- ☐ —Hydrex®
- ☐ —Slip Lawn

HOSE:
- *☐ —Acid
- *☐ —Air
- *☐ —Fire
- *☐ —Flexible Rubber Pipe
- *☐ —Pinch-Valve
- *☐ —Servall®
- *☐ —Steam
- *☐ —Twin-Weld®
- *☐ —Water
- ☐ MECHANICAL FEEDERS
- ☐ STACKERS
- ☐ CAR SHAKEOUTS
- ☐ TRIPPERS
- *☐ MOLDED RUBBER GOODS
- ☐ DESIGN AND CONSTRUCTION OF COMPLETE MATERIALS HANDLING SYSTEMS

*For immediate information about these industrial rubber products, call your Hewitt Rubber Distributor (See "Rubber Products" Classified Phone Book).

Hewitt-Robins Incorporated
666 Glenbrook Road
Stamford, Connecticut

NAME

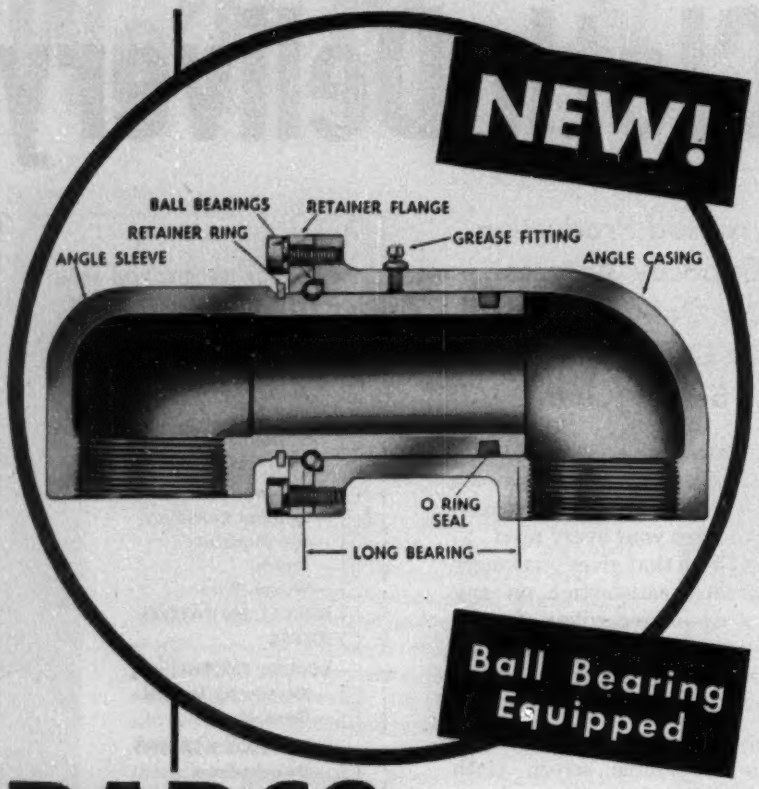
TITLE & COMPANY

STREET ADDRESS

CITY PO ZONE STATE

INCORPORATED

EXECUTIVE OFFICES: STAMFORD, CONNECTICUT



BARCO SWING JOINTS

FOR LOADING AND UNLOADING LINES

HERE is Barco's new, attractively priced, all-steel ball bearing *Swing Joint* designed specifically to provide for movement and flexibility in metal pipe loading or unloading lines handling petro-chemicals, oil, alcohol, and other fluids.

11 DIFFERENT STYLES—The Barco line is complete with single swing, double swing, and counter-balance styles to meet every need! Sizes 2", 2½", 3", 4".

SUPERIOR DESIGN—In Barco Swing Joints, *the ball bearings do not fall out when joints are taken apart!* Long bearing provides adequate pipe support. Special O-ring seal insures leakproof service over wide temperature range, −40° F. to +225° F.

EASY MAINTENANCE—Joints can be disassembled for inspection without disconnecting piping. O-rings are easily renewable in the field.

INFORMATION—Send for latest Catalog No. 400 containing engineering and ordering information. *Worldwide sales and service.*

BARCO *Manufacturing Co.*

1816 C Winnemac Avenue Chicago 40, Illinois

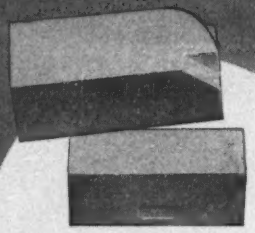
In Canada: The Holden Co., Ltd., Montreal

The Only Truly Complete Line of Flexible Ball, Swivel, Swing, and Revolving Joints

McDANEL

HIGH DENSITY PORCELAIN

- MILL LINING
- SPECIAL SHAPES
- TANK LINING



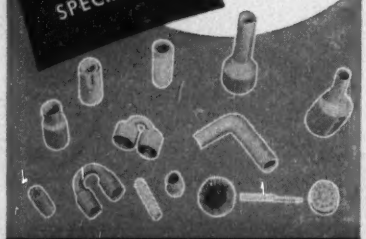
McDanel High Density Mill Lining in routine production grinding in Mills of various sizes shows better than two times longer service over the regular porcelain brick. This high density lining brick—for all types of ball mill grinding—comes in a complete range of sizes to fit every size mill.

Porcelain Specialties

McDanel is equipped to design and manufacture porcelain specialties to meet your individual requirements, quickly and efficiently. We will be glad to help you solve your problems.

HIGH TEMPERATURE PORCELAIN SPECIALTIES

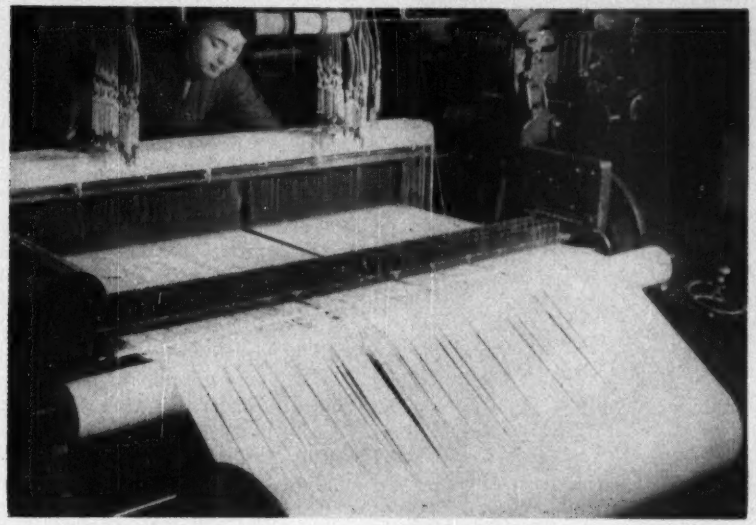
Write for "Industrial Porcelain" catalog



McDANEL

REFRACTORY PORCELAIN CO.

BEAVER FALLS, PENNSYLVANIA



More Chemicals for Textiles

Both natural and synthetic fibers depend more and more on chemical treatment. Chemical sales picture is bright despite ups and downs of the textile industry.

Almost every chemical company has bought a ticket in the textile sweepstakes. And every ticket is a winning one.

It doesn't matter whether the trend of the future is toward 100 percent chemical fibers or toward chemically-improved natural fibers—the textile industry is going to keep buying more chemicals. Chemicals enter into nearly every phase of textile operations from the growing of the natural fibers or the manufacture of synthetics right down to the final finishing processes.

In recent years the textile industry has been plagued by brief and abrupt swings in output. Almost overnight—or so it seemed—shortages would give way to burdensome inventories.

▶ **Chemical Sales Up**—Naturally, sales of chemicals to the textile industry are affected by these ups and downs. But the important fact is that textile chemicals continued their advance even during slack periods. The market for textile chemicals does not depend solely on the prospects for expansion in the textile industry. Demand for textile chemicals far outstrips growth in textile consumption.

The present day textile industry bears scant similarity to its counterpart of yesteryear. The industry has been through a series of chemical transformations.

The revolution began with the discovery—in the late 19th century—of coal-tar dyes. That phase has long since reached the leveling-off stage. Dye consumption seems to be holding firm at about one pound per person per year.

Another stage was ushered in with the introduction of rayon in 1911. The development of about a dozen new man-made fibers during the past decade testifies that this phase is just getting into high gear. Indeed, the synthetics are steadily increasing their share of fiber consumption.

Recent articles in the business and technical journals have stressed the close tie between chemicals and man-made fibers. Much less attention, however, has been given to the increasingly important role played by chemicals in the natural fiber section of the textile industry.

▶ **Woolens**—Wool offers a substantial and a growing market for producers of textile chemicals. In addition, the wool industry is a source of new by-products which are finding their way into the textile industry.

Scouring is the initial operation in wool textile manufacture. Last year 4 billion pounds of grease wool were scoured in order to remove about 1.7 billion pounds of grease, suint and insoluble impurities. New and improved chemicals now make it possible to remove the grease in organic solvents. Subsequently, the solids and suints are removed by light soap rinses.

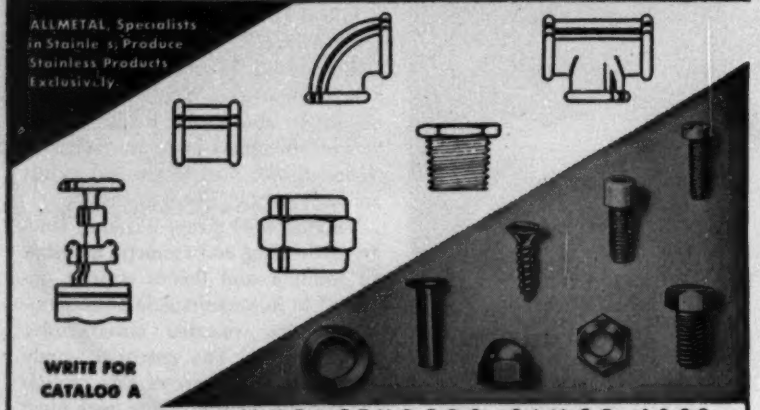
Purified wool grease is sold as lanolin to the drug and cosmetic industry. In addition—and this is entirely unrelated to its usefulness in cosmetics—lanolin has valuable anti-corrosive characteristics. The potential supply of wool grease, however, far exceeds the present demand. New uses must be found if many mills are to be prodded into recovering their wash water.

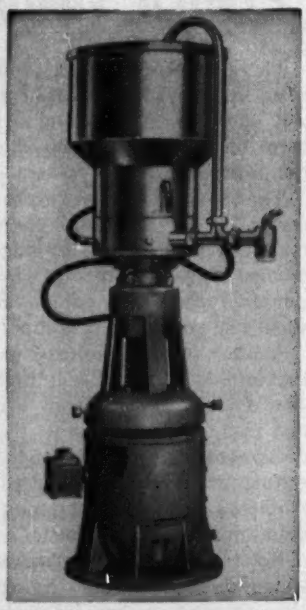
The suint is made up of water-soluble potash salts and it may be possible to prevent its value as a fertilizer from being nullified in the scouring process. At present the Research Laboratory of the Department of Commerce is actively investigating possible new uses for the products that can be recovered from wool grease.

Mineral oils and combinations of mineral oils with natural oils are added to the wool as it goes through the spinning and carding process. But textile and chemical engineers admit they have a lot to learn about the true function of these oils. When present research yields more information, it will be possible for chemical producers to develop more efficient products for this operation.

Dyeing is the next important process relying heavily on chemicals. Several new techniques have recently been discovered. As a result of the molten metal dyeing process the dye does not become fixed until after the thorough penetration and distribution of the dyestuffs through the fabric. Experimentation in high temperature and low temperature dyeing has shown that many chemical compounds which used to be inadequate for dyeing should now be considered.

Recent developments in the sizing

FOR YOUR STAINLESS STEEL FITTINGS AND FASTENERS
IT'S ALLMETAL FOR QUALITY AND DELIVERY
Allmetal's fasteners and fittings are stocked in types 304 and 316. Specials to order. All made right by Allmetal.
ALLMETAL, Specialists in Stainless Produce Stainless Products Exclusively.

WRITE FOR CATALOG A
STAINLESS STEEL FASTENERS
MANUFACTURERS SINCE 1929
ALLMETAL
SCREW PRODUCTS COMPANY, INC.
33 GREENE STREET NEW YORK 13, N. Y.

New Type Eppenbach
COLLOID MILL
Featuring
Large Tangential Outlet which prevents back pressure and allows increased output capacity Both Rotor & Stator are Interchangeable Stellite rings and stones—facilitating replacement when required.
Sanitary fittings throughout.
Illustration shows large production Mill Model QV-11 with 15 H.P. motor
Eppenbach Colloid Mills operate at speeds approaching the theoretical minimum required for true wet micro grinding—shaft speeds up to 10,000 r.p.m. depending on size and type of mill.
These Mills assure uniform grind through advanced engineering features including (1) Improved ball bearings which center the shaft and minimize lateral whip and (2) Invar shafting with zero coefficient of heat expansion.
All Mills can be made with pressure feeds and jacketed hoppers.
Consult our Sales Department with your technical problems.
Write for literature describing Eppenbach equipment —now manufactured and sold by:

Direct-drive model shown operates at 3500 RPM.
Higher speeds can be furnished.
Colloid Mills made in all sizes from ¼ H.P. model laboratory size to 50 H.P. model.
ADMIRAL TOOL & DIE CO., INC.
45-10 VERNON BOULEVARD
LONG ISLAND CITY, 1, N. Y.

and felting of wool make it possible to do a more efficient job than was formerly the case. And, according to the chemical engineers working in this field, many more new advances are in sight.

COTTON

The initial chemical contribution to cotton involves reducing the cost of production. The 58 percent increase in lint cotton production per acre in the last 20 years is due largely to better farm chemicals. Chemicals are used as fertilizers, insecticides and defoliants. Current research indicates that chemical fungicides will soon be used in greater quantities.

When cotton leaves the farm, however, it is not finished with chemicals. Indeed, it is then most receptive to the opportunities offered by chemicals. And, the quantities involved are large.

If only one per cent of an interfiber frictional material were applied to the more than 4 billion pounds of cotton processed by mills, the use would total more than 40 million pounds.

More than 7 billion yards of cotton woven goods are bleached, dyed, printed or finished each year. Every yard has to be chemically treated and most engineers agree that the use of chemicals in cotton finishing is just emerging from the swaddling stage.

Cotton's versatility makes it a logical field for chemical processing. Market research analysts have listed more than thirty quality characteristics that consumers want improved in cotton textiles. The majority of these can be improved by chemical finishing. Progress has already been made, for example, in improving dirt resistance, heat resistance, drape and resiliency, luster, dimensional stability and absorbency.

While no equation is available to predict how much expansion chemicals can expect in the processing and finishing of cotton fabrics, it is agreed that textile chemicals can look forward to substantial growth in this field.

ADD IT ALL UP

When all the results are tallied, it is clear that the textile industry is rapidly shifting to a chemical base. A glance at the list of chemical firms with big stakes in textiles shows that practically all the industry leaders are

Cold for fatty acid crystals

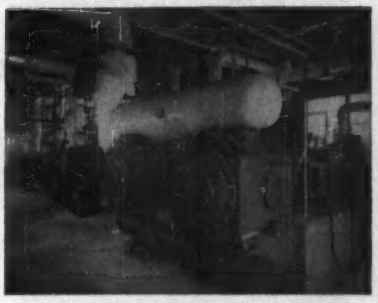
Solvent crystallization is one of the important processes at Armour and Company's new chemical plant at McCook, Ill. The process is used to separate acids that contain the same number of carbon atoms and cannot be separated by fractional distillation.

A vital part of this process is the Worthington refrigeration system consisting of two double-pipe stainless-steel chilling machines, a horizontal duplex two-stage ammonia compressor, horizontal duplex ammonia booster compressor, flu-gas compressor, and shell and tube equipment.

Armour is another in an ever-growing list of "big names" in the chemical industries who have chosen Worthington refrigeration. Others include: B. F. Goodrich Chemical Co., Avon Lake, Ohio; Dow Chemical Co., Freeport, Tex.; Minnesota Mining and Manufacturing Co., St. Paul, Minn.; Lion Chemical Co., El Dorado, Ark.; E. I. DuPont de Nemours & Co., Edgemore, Del., Orange, Tex.; Shell Chemical Co., Houston, Tex.; Gulf Oil Corp., Port Arthur, Tex; Rohm & Haas Co., Houston, Tex.

When these well-known companies look for refrigeration to be used in controlling a myriad of intricate reactions, they look for the best. Their choice is your best evidence that *there's more worth in Worthington.*

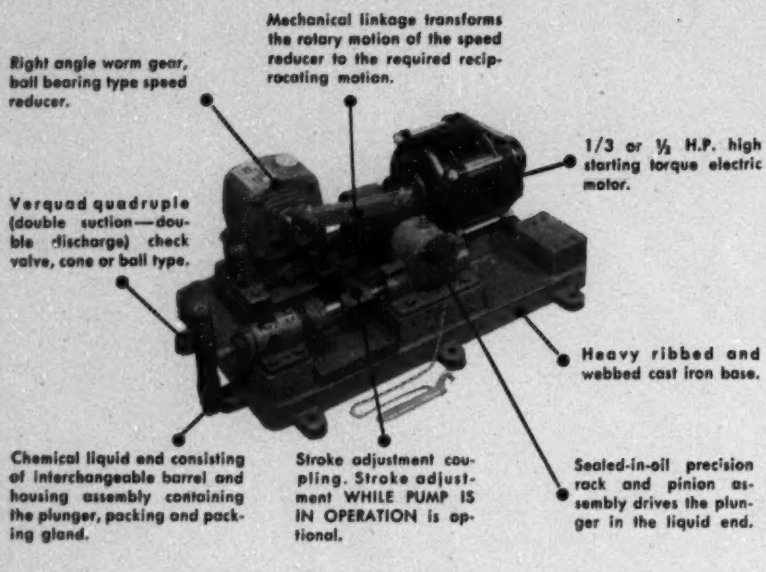
Worthington Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J.



WORTHINGTON HORIZONTAL DUPLEX, TWO-STAGE AMMONIA COMPRESSOR, part of the complete Worthington refrigeration system at Armour's McCook, Ill., chemical plant. System is unusual in that compressors are piped and instrumented to permit two levels of refrigeration—one at 5F, the other at −50F. Engineer and contractor: E. B. Badger & Sons Co., Boston, Mass.

A.2.29

Simplicity of design plus precision manufacture


Mechanical linkage transforms the rotary motion of the speed reducer to the required reciprocating motion.
Right angle worm gear, ball bearing type speed reducer.
1/3 or ½ H.P. high starting torque electric motor.
Verquad quadruple (double suction—double discharge) check valve, cone or ball type.
Heavy ribbed and webbed cast iron base.
Chemical liquid end consisting of interchangeable barrel and housing assembly containing the plunger, packing and packing gland.
Stroke adjustment coupling. Stroke adjustment WHILE PUMP IS IN OPERATION is optional.
Sealed-in-oil precision rack and pinion assembly drives the plunger in the liquid end.

assure high standards of accuracy and dependability in Hills-McCanna "U" type metering and proportioning pumps

Whenever small volume flows must be metered or proportioned continuously, the simple, foolproof design of Hills-McCanna "U" Type Pumps pays big dividends. For flows up to 24 gallons per hour per feed, its accuracy and reliability suit it for research, pilot plant operation and full scale processing alike.

The "U" type pump is available in a range of capacities with 1, 2, 3 or 4 feeds. Its design permits use of a wide variety of materials of construction in the liquid end.

Write for descriptive literature which gives full information.
HILLS-McCANNA CO., 2341 W. Nelson Street, Chicago 18, Ill.

HILLS-McCANNA

metering and proportioning pumps

Also Manufacturers of:
SAUNDERS TYPE DIAPHRAGM VALVES
FORCE FEED LUBRICATORS • MAGNESIUM SAND ALLOY CASTINGS

there. Heading the list is du Pont with nearly 30 percent of its sales beamed to the textile industry.

This industrial transformation provides advantages for all concerned. Consumers can choose from among a wider selection of fabrics than anyone thought possible before the war. Textile producers find that their range of new and improved products has put a little dash and excitement into the pattern of consumer demand.

And chemical companies have a market for their products which is certain to expand.

LITTLE BONER

Too Much Pressure Drop

The day finally came for the start-up of the new unit in New Jersey. Although everything looked O.K., there was a bit of nervousness among the young design engineers who had done most of the job.

But only one thing seemed to go wrong: The refrigeration system wasn't able to keep the temperature down on the cold storage tanks for the de-inhibited intermediates. It was a pretty serious matter, of course, and could be dangerous.

Finally the young engineer who had handled the refrigeration job was told—with dashes of profanity and sarcasm—that his specifications for the system were all wet. The poor fellow hid in a secluded spot and spent long hours checking his calculations.

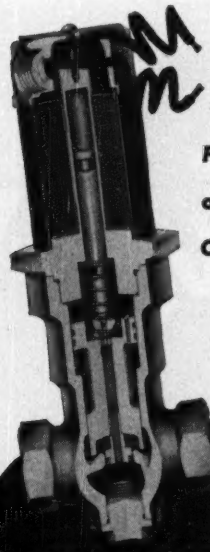
Finally he decided he must have underestimated the pressure drop in the complicated brine circulating system. Down in the mouth and red of face, he went out to talk to the plant manager and to recommend increasing the size of the brine lines. Dammit, his first job and he'd pulled a boner!

But for some reason the manager didn't seem to be irritated any longer. . . .

"Forget it," he said, "your calculations are O.K. We just took the rag out of the brine line."

"I went through hell," the young design engineer now admits, "but I learned one lesson: Don't let the lack of experience destroy your confidence in yourself."

Send your own true Little Boner to the Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.



For Remote or Automatic Control . . .

FULL-PORTED
PACKLESS
DEPENDABLE

for pressures to 3,000 psi.

Atkomatic Solenoid Electric Valves are available in sizes from ¼ inch to 3 inches, and for pressures to 3,000 psi. Adjustable timing on the closing stroke is available on all valves up to pressures of 300 psi.

Designed with only three moving parts and no external linkage, wear and maintenance are greatly reduced. Availability for normally opened or normally closed operation makes it possible for the valve to fail safe in the event of power failure.

Atkomatic Solenoid Electric Valves are made with standard coils of paper insulation, vacuum impregnated and baked for resistance to moisture, or glass-insulated coils for higher temperatures.

Write for more complete information

For all your Solenoid Electric Valve Requirements, Look to . . .

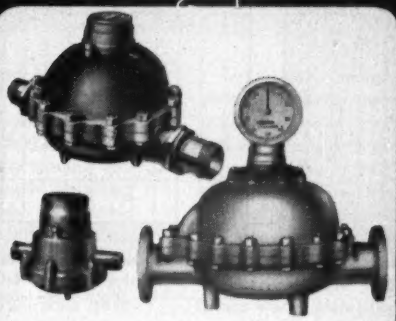
Atkomatic

SOLENOID

ELECTRIC VALVES

ATKOMATIC VALVE COMPANY
525 Abbott Street Indianapolis 25, Indiana

"I suggest NIAGARA METERS Their wide range will give us ACCURATE MEASUREMENT of all liquids we use!"



BUFFALO METER CO.

2891 MAIN STREET
BUFFALO, N.Y.

The excellent accuracy of NIAGARA METERS minimizes waste and losses in the measurement of chemicals, solvents, oils, hot water, cold water, syrups and other liquids. Nearly all volumes and types are handled, from 1/30 to 1000 gallons per minute. Special electric contact meters for automatic batch metering. Stainless steel meters for corrosive liquids.

Be sure you know all the advantages of NIAGARA METERS.

Send in the Data Request blank below — today.

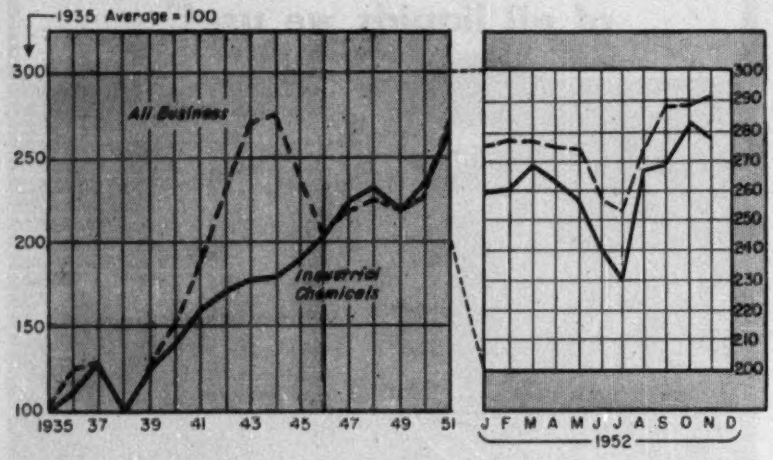
Gentlemen:

Please send me complete information on the use of economical NIAGARA METERS, based on the data below:

Liquid_____ **Pressure**_____ **p.s.i.**
Temp._____ **° F.**
Flow rate_____ **g.p.m.**
Maximum batch_____ **gals.**
Name_____ **Title**_____
Company_____
Address_____

Process Industry Trends

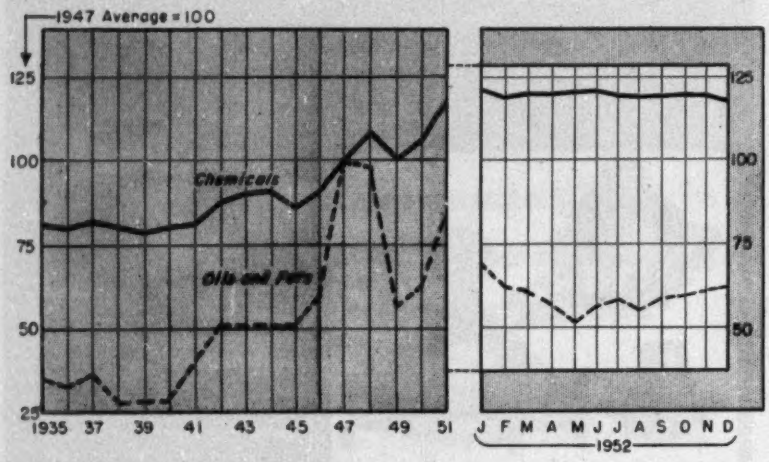
CONSUMPTION



Industrial Chemicals Index

	November (Est.)	October (Prelim.)	September (Revised)
INDEX	279.01	283.35	268.04
Fertilizer		62.99	55.60
Pulp and paper	29.57	30.60	27.09
Petroleum refining	27.42	27.75	27.40
Iron and steel	17.31	17.99	17.13
Rayon	28.77	30.61	30.73
Glass		24.48	22.84
Paint and varnish		28.84	28.34
Textiles		10.58	10.72
Coal products		11.69	11.07
Leather		4.45	4.45
Explosives		9.66	9.57
Rubber	6.33	6.79	6.04
Plastics		17.00	17.06

PRICES

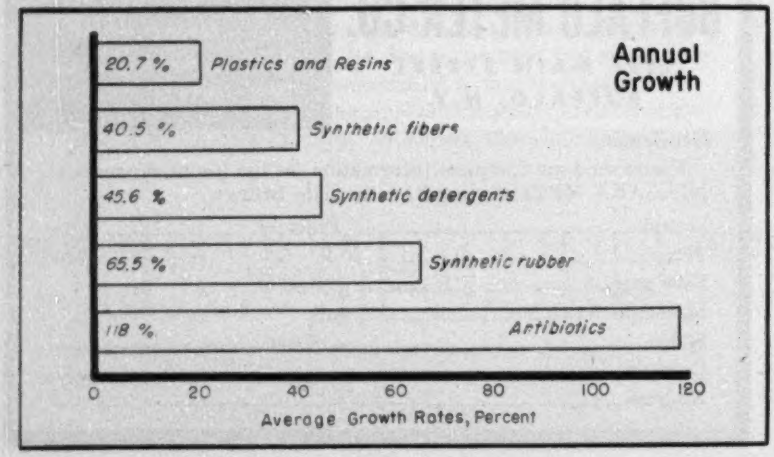


Chemical Engineering's Price Indexes

Chemicals	UP	+ 0.2%
Oils and Fats	UP	+ 3.6%

	Chemicals	Oils & Fats
As of January 1, 1953	117.92	65.22
Last month	117.71	62.93
January, 1952	121.62	68.28
January, 1951	117.96	88.68

HIGHLIGHT OF THE MONTH


Annual Growth
20.7 % Plastics and Resins
40.5 % Synthetic fibers
45.6 % Synthetic detergents
65.5 % Synthetic rubber
118 % Antibiotics
0 20 40 60 80 100 120
Average Growth Rates, Percent

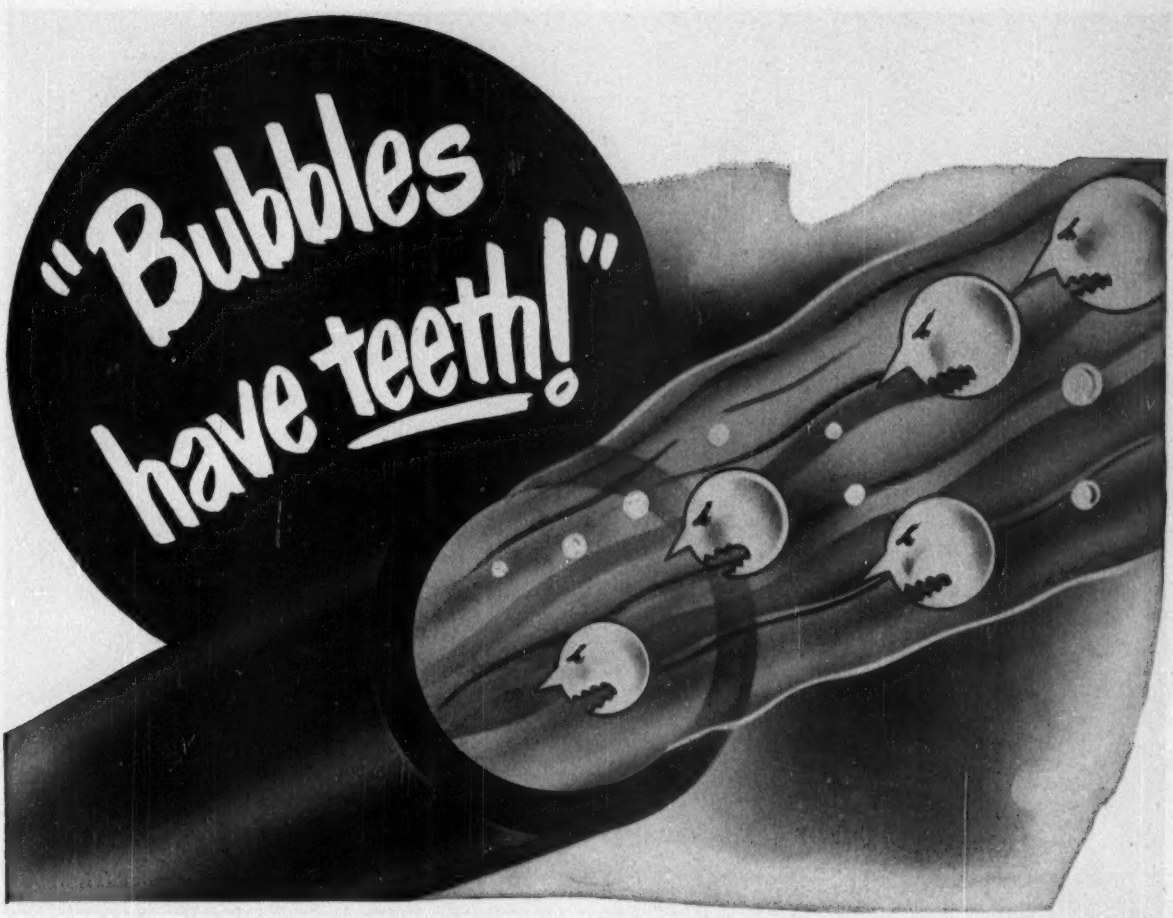
Our Growth Industries

The chemical process industries have a number of growth industries reviewed in the recent Department of Commerce study, "Markets After the Defense Expansion."

Antibiotics ranks first of all industries studied with an average growth of 118 percent per year for the period 1945-1951.

Synthetic rubber is well up in the list with an average of 65.5 percent for the years 1939-1951.

Growth periods studied vary somewhat: synthetic detergents, 1937-1951; man-made fibers, 1940-1951; plastics and resin materials, 1929-1951.



QUITE a number of years ago Revere coined the phrase "Bubbles have teeth." This refers to the fact that what is called air entrainment is highly damaging to condenser tubes. Bubbles carried along with the cooling water set up a strong disturbance in it, disrupting the film that should protect the metal, and actually seeming to eat away the tube. The oxygen contained in the air bubbles also is destructive. Fortunately, the effects of air entrainment on condenser tubes are sufficiently distinctive to permit Revere Research to detect the trouble by examination of short lengths cut from tubes that have failed before their time.

Thus it happens that every once in a while the Research Department in Rome, New York, working through the Technical Advisory Service, is able to say that there is air leaking into a condenser it has never seen, in a far-off state. The problem then is to seal the water system against the entrance of air. This is not always an easy task, and it is one that the Revere Technical Advisory Service is glad to tackle together with the customer if asked to do so. After all, we want our condenser tubes to last as long as possible; that's what makes customers happy, and builds and preserves our reputation as producers of fine tubes.

In one such instance of bubble trouble, the operator, a public utility, could find no visible sign of a leak. Checking and tightening every bolt and seal produced no results. Finally it was decided to put plate glass windows in some of the inspection plates, in order to see what was going on inside. This located the defect, a stream of bubbles being easily seen pouring out of a gasket. The water was flowing past that gasket with sufficient velocity to suck air in.

In another instance, a few samples of failed tubes from an oil refinery (located almost 3,000 miles away from the utility) were sent to Revere's Research Department. The refiner was told that his trouble was due to bubbles. Again, a check of the condenser showed nothing. The water inlet and outlet lines and all gaskets and bolts seemed to be perfectly tight. Here was another puzzler. But once again it seemed plausible to assume that air was being drawn in where water velocity was high enough to create a suction. The search finally went all the way back to the water pumping station, where two cracked castings were located. Air sucked in through two tiny cracks was enough to do a lot of damage; bubbles do indeed have teeth.

Revere will gladly consult with you concerning condenser tubes, their selection, specification, and conditions of use. For condenser tubes and tube sheets in all the usual alloys, see Revere.

REVERE

COPPER AND BRASS INCORPORATED

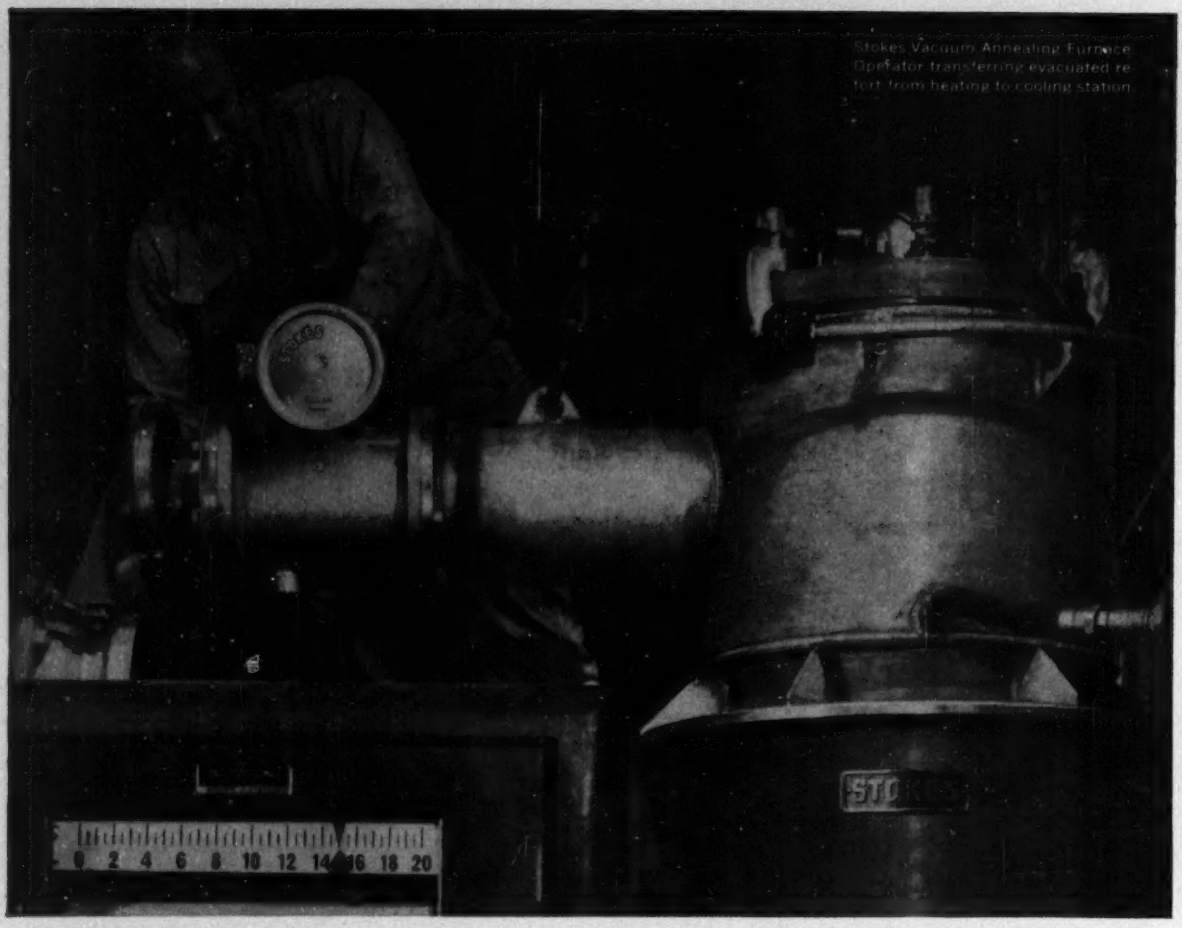
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



Make the step... from laboratory to production with Stokes High-Vacuum equipment

For processing titanium, zirconium, hafnium, and other metals . . . for low-cost melting, annealing and sintering of metals which must be processed under vacuum, Stokes makes the vacuum furnaces.

For the production of all high-vacuum processing equipment, Stokes has the largest and most diverse manufacturing facilities.

We build to customers' requirements, with a sure knowledge of what *is* and what is *not* practical.

Stokes techniques of building vacuum processing equipment which *works* and *produces in bulk* at low cost have been developed during fifty years of experience with vacuum and high vacuum.

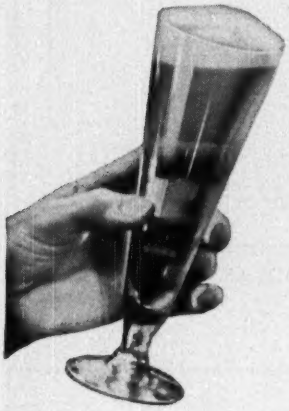
Visit the Stokes plant and see for yourself that Stokes is first in Vacuum . . . first in the manufacture of vacuum processing equipment which takes you over the gap between the laboratory and commercial production.

F. J. STOKES MACHINE COMPANY,
PHILADELPHIA 20, PA.

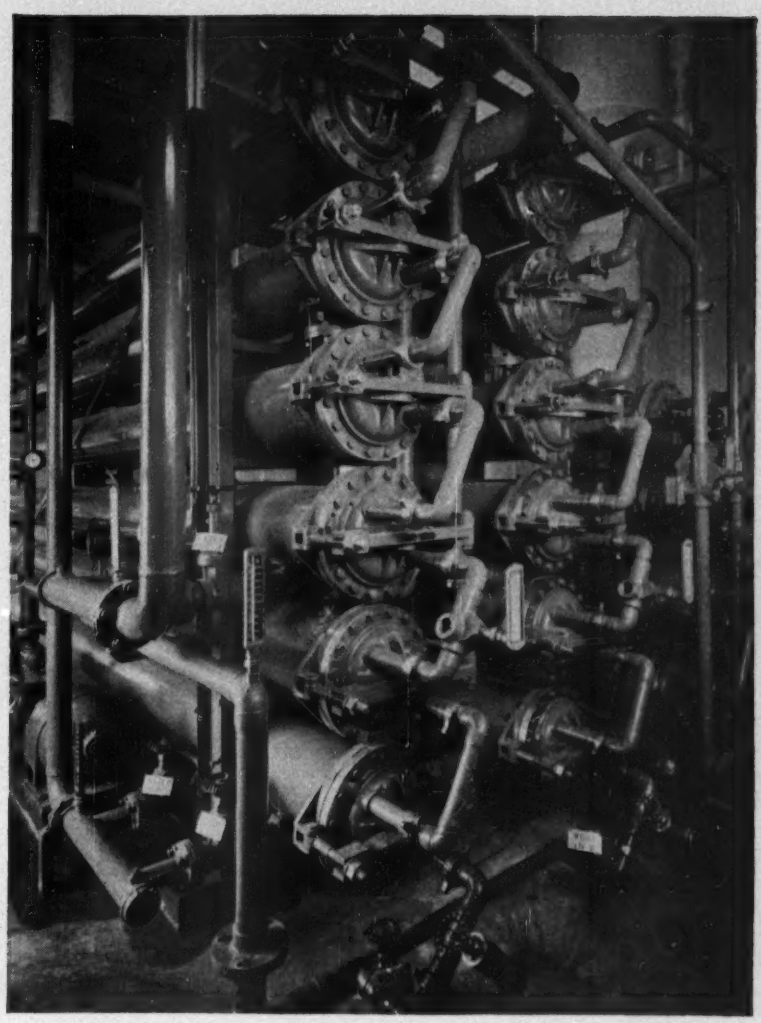
STOKES

STOKES MAKES Plastics Molding Presses / Industrial Tabletting and Powder Metal Presses / Pharmaceutical Equipment / Vacuum Equipment / High Vacuum Pumps and Gages / Special Machinery

have a beer?



This Hot Wort Cooler Handles 130 GPM →



HOT WORT is beer as it comes from the kettle, before fermentation. In this cooler in the Blitz-Weinhard Brewery wort is rapidly brought down from 200° to 45°.

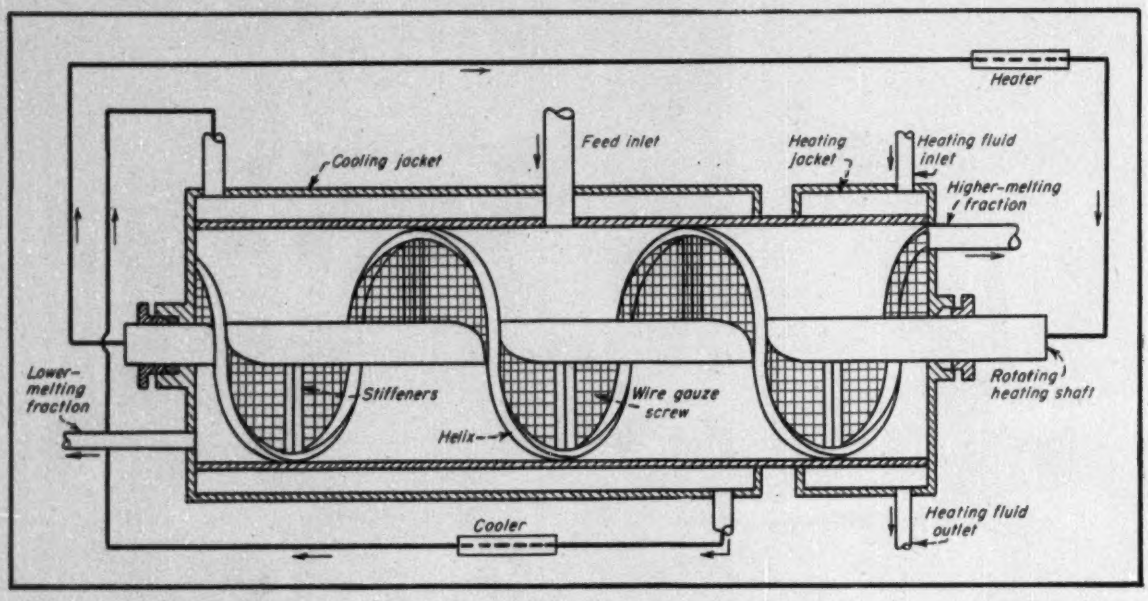
—and economical AnacondA Copper—traditional brewer's metal —makes it highly efficient and insures long life

There was good reason to choose ANACONDA Copper for this heat exchanger made by Enzinger Union Corporation, Angola, N. Y., for the Blitz-Weinhard Brewery, Portland, Oregon. Copper is friendly to beer and will not corrode; it costs less, yet cools faster because it has a higher heat transfer rate than other metals. In this cooler not only the inner tubes, but also the outer shells are made from hard-drawn copper. The inner tube surfaces of copper may be economically cleaned by forcing brush-balls under pressure through the inner tubes, which are connected in series.

In chemical processing, selection of the right metal and the right alloy determines economy of operation and length of service life. For no one metal or alloy is best for *all* conditions. If you have a specific application in mind, consult our Technical Department. Their experience in brass and copper is over a century old . . . and is at your disposal. Write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

82180

for efficient heat transfer **ANACONDA®** heat exchanger tubes



Separate Your Solid Solutions!

New crystallizer can also be used for partial separation of eutectic mixtures. Utilizes helical scraper and wire gauze screw conveyor.

Complete separation of two-component solid solutions is effected in Robert A. Findlay's new continuous fractional crystallizer. The invention (U. S. 2,617,273) is assigned to Phillips Petroleum Co.

It works on a countercurrent principle, with cooling supplied at one end, and heating at the other. Liquid feed enters at an intermediate point and is separated into two fractions which leave at opposite ends of the apparatus. The invention is especially useful for separating solid solutions, but can also be used when a eutectic exists.

The apparatus consists of a horizontal cylinder, which is jacketed in two sections, and a central horizontal rotating shaft (see cut). The left end of the cylinder is the coldest point, partly because of the circulation of coolant, and partly because a heating medium flows through the central shaft from right to left. Most of the separation takes place in this section. The right side of the cylinder is heated by the circulation of a heating agent through the jacket. Thus the crystalline products are partially melted and can be discharged as a slurry or as a liquid.

▶**Wire Gauze Conveyor**—Crystals are formed on the walls of the cylinder. These are continuously scraped from the cold wall by a helix attached to the central rotating tube with stiffeners. A wire gauze conveyor screw is also attached to the shaft.

As the screw rotates it carries crystalline material upward and to the right. This material falls on the hot central tube and partial melting occurs. This sets up a continuous recrystallization process with crystals moving to the right and displaced liquid to the left, through the wire gauze.

The liquid, as it flows toward the cold end, is gradually stripped of high-melting components. The crystals gradually become richer in high-melting constituents.

In the case of a solid solution of two components complete separation is possible. If the feed is a rich eutectic mixture one component is separated out in the pure state with the eutectic mixture as the other product.

The Phillips Petroleum Co. has also patented two modifications of the equipment described above. These are disclosed in U. S. 2,615,793 and 2,615,794, and use reciprocating pistons of perforated material to move the crystals.

Rotating Cylinder Gives Liquid-Liquid Contacting

Countercurrent liquid-liquid contacting can be obtained in a rotating horizontal or vertical cylinder, claims Samuel C. Carney in U. S. 2,614,064 assigned to Phillips Petroleum Co.

Carney points out that centrifugal force sets up a cylindrical interface between the two layers that runs the entire length of the equipment. Evidently the heavy liquid forms an outer annular ring surrounding an inner cylinder of light liquid. The heavy and light liquids are fed at opposite ends of the apparatus and flow countercurrent to each other.

A novel expedient gives intimate

His business paper . . . of course

No man who takes his job seriously takes his business paper lightly. You'll find the **Best Informed Men in your Field** read every issue . . . straight through. They can't afford not to. Matter of fact, who can, in these fast-moving times? New ideas, new products, new methods, new techniques crop up one-a-minute. Today, change is the one thing that's certain . . . and when your own formula for change is a better job, a bigger profit, a more important place in the industry, you *need* the continuous touch with facts and news and "how-to" that only your business paper provides. The editors continuously scout the field for you; the advertisers report new products or new ways to use old ones . . . new profit angles . . . new sources for things you buy. Read cover to cover—with a sharp eye. That's what makes *you* one of the **Best Informed Men in your field,** too.

Did you know that this business paper . . . because it's a member of the Associated Business Publications . . . has some extras to offer you? It's a *paid*-circulation paper . . . which means the editors must keep their magazines well sold and well read. They get together continually in the Association . . . meet other editors in clinics, conferences and courses . . . work to make a good paper a better paper—to serve you in more and more ways. Your business paper is worth every minute you spend with it!

NEXT ISSUE the Best Informed Men in your Field will be reading . . .

THE YEAR FOR DECISION

Facts and figures of the Chemical Process Industries and what they forecast for the coming year

Chemical Engineering

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

VECO VICTORY

HOW ARE YOU Measuring and Controlling

• TEMPERATURE
• CURRENT
• POWER
• VOLTAGE ?

• PRESSURE
• VOLUME
• COMPOSITION
• FLOW OF AIR, GAS, AND LIQUIDS ?

THERMISTORS
VARISTORS ANALYSIS CELLS
COMBUSTION EFFICIENCY TESTERS

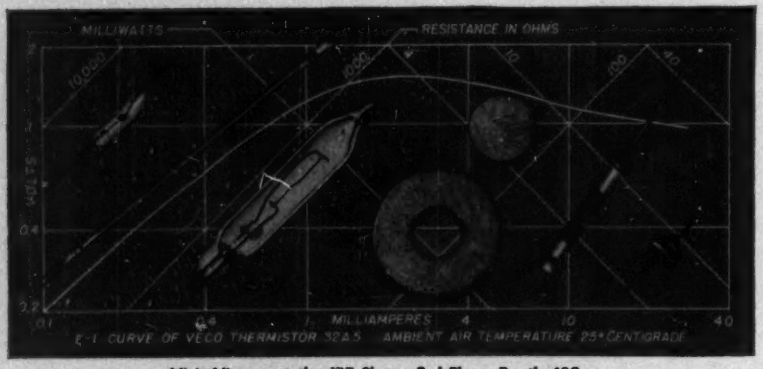
VECO THERMISTORS, approved and accepted by Government Agencies, are highly versatile new circuit elements - electrical resistance varies extensively with relatively minute thermal changes.

QUANTITY PRODUCTION - stocked in a wide range of specific resistance values and made in the forms of rods, discs, washers, and beads.

Western Electric and Victory have a cross-license arrangement covering thermistors, and are the only manufacturers in the U. S. making the bead type.

VECO VARISTORS are used in voltage control and limiting circuits, and VECO GAS ANALYSIS CELLS incorporate the extremely sensitive VECO THERMISTORS.

Submit your unusual or new measurement or control problem to Victory for a prompt complete analysis and recommendation.

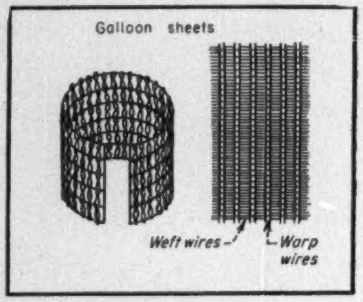


Visit Victory at the IRE Show, 3rd Floor, Booth 403 - Grand Central Palace, New York, N. Y. - March 23-26.

Victory ENGINEERING CORPORATION
SPRINGFIELD ROAD, UNION, NEW JERSEY
Telephone UNionville 2-7150
Please send me your VECO DATA BOOK On THERMISTORS
NAME_____
COMPANY_____
ADDRESS_____

contacting between the two liquids. Magnetic solid particles (such as soft iron) are placed in the apparatus. Then a magnetic field is set up periodically; this pulls the particles from the outer heavy liquid through the interface and toward the center into the light liquid.

The magnetic field is interrupted periodically. Centrifugal force then causes the particles to move freely from the light liquid outward to the heavy liquid; films of the light liquid are carried along. This gives intimate contacting, Carney claims.



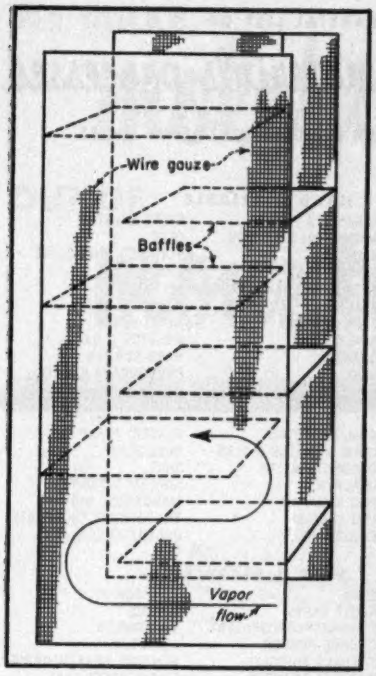
New Packing Material For Liquid-Gas Contacting

In a series of four patents, Imperial Chemical Industries, Ltd. discloses new types of packing material, new methods of constructing liquid-gas contacting towers, and a new method of operating packed towers used for liquid-gas contacting. The inventor in each case is Olaf G. Dixon.

• U. S. 2,615,699 presents a new type of packing material consisting of a "galloon netting" (see cut). This is a woven material in which the warp threads are straight instead of being bent as in the case of normal weaving, while the weft threads are arranged closely against one another. The warp threads are preferably thicker and stronger than the weft threads.

The netting can be made of various materials, but wires of such metals as copper, brass, phosphor bronze, cupronickel, or stainless steel are preferred. A typical netting contains 7 warp wires and 44 weft wires per inch, with diameters of 0.036 in. and 0.022 in., respectively.

The galloon sheets may be arranged in an orderly way throughout the column, or they may be randomly disposed. It is possible of course to make the netting into various other shapes such as Raschig rings, Lessing



rings or Berl saddles. The principal advantage claimed for galloon netting as a packing material is that exceptionally high contacting efficiency is achieved without preflooding. This is attributed to the pronounced self-wetting properties of galloon netting.

• If other types of wire packing are used, it is necessary to preflood the column in order to wet the packing. Some new methods of doing this are disclosed in U. S. 2,615,832. In general, they involve the use of an adjustable orifice at the bottom of the column which permits flooding while the normal gas or vapor upflow is maintained. The orifice is gradually opened until the desired liquid rate is established.

• In U. S. 2,615,700, regularly arranged vertical sheets of galloon netting are used, either flat or as cylinders. In either case, baffles of various types are used in conjunction with the netting to form a tortuous passage for the vapor. For example, a rectangular tower can be arranged with staggered horizontal baffles of unperforated sheet metal between vertical sheets of galloon netting. (see cut). Other arrangements are disclosed in the patent.

Good results can be obtained with wire gauze and unperforated baffles instead of galloon netting provided the column is preflooded. The claim in this patent is directed solely to the use of galloon netting with baffles.

• A regular vertical arrangement

SLY PIONEERS and LEADERS in INDUSTRIAL DUST CONTROL

SOY BEAN PLANT SAVES $400 PER DAY Through DUST RECOVERY

Soy Bean Mill. Two large double file Sly Dust Filters handling soy bean meal dust.

Because of the meal dust created in processing soy beans, this company* included Sly Dust Filters, as standard equipment five years ago, in its original layout.

The Sly Filters collect 5½ tons of soy bean meal *daily*, at a value of upwards of $400. Not only is the company highly pleased with these savings but also with the resulting cleanliness of its plant. Filter maintenance has been insignificant.

In crushing, shredding, pulverizing, loading, packaging, operations—in various process industries—dust is created. If valuable, the dust can be reclaimed profitably. Even if the dust has no value its collection pays off in cleaner plants, better working conditions and reduced costs.

Expertly designed and built, Sly Dust Filters offer many advantages in greater filtering capacity, easier bag replacement, automatic control, and other features which spell low cost operation.

MAY WE TELL YOU MORE ABOUT SLY FOR YOUR PARTICULAR APPLICATION?

*Name upon request.

THE W. W. SLY MANUFACTURING CO.

4771 TRAIN AVENUE • CLEVELAND 2, OHIO

New York • Chicago • Philadelphia • Syracuse • Detroit • Buffalo Cincinnati • St. Louis • Minneapolis • Birmingham • Los Angeles • Toronto

of wire gauze sheets or of galloon netting can be used without baffling, but with means for distributing liquid at the top of the column so that it will run down each sheet. Such a system is described in U. S. 2,615,835.

For example, a mild steel distillation column 2 feet high with a cross-section of 2¼ sq. in. was fitted with six vertical sheets of phosphor bronze wire gauze (60 mesh), about ¼ in. apart. The column was equipped with a boiler and a reflux condenser. Five liters of a mixture containing 20 mole percent carbon tetrachloride and 80 mole percent benzene was placed in the boiler.

The boiler was heated to give a distillation rate of 4000 grams per hr. and the column was placed on total reflux. An adjustable orifice at the bottom was partially closed to preflood the packing. Then, without altering the rate of distillation, the orifice was gradually opened allowing the liquid to run freely back to the boiler. The number of theoretical plates was 3.75.

Much higher contacting efficiency is achieved with the use of random packing, but the method described in this patent has the advantages of extremely low pressure drop, and of being able to operate at high vapor velocities or low liquid rates.

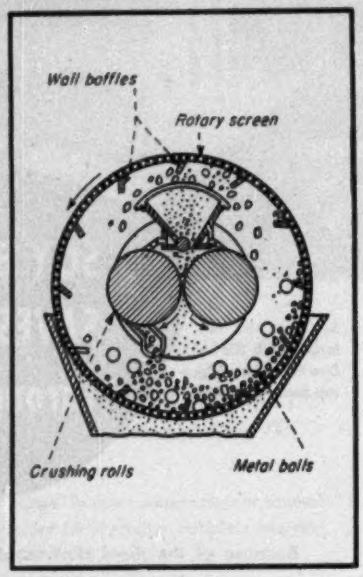
New Freeze-Drying System Cuts Time

Very high freeze-drying rates can be attained in a continuous system invented by Theodore R. Folsom.

The material to be freeze-dried is pumped through a specially designed "injector" which feeds it into a vacuum chamber in thin streams of frozen material. Most of the water immediately evaporates, breaking the streams into fine particles. These are tumbled continuously in the vacuum chamber (for example by using a rotary drum as the vacuum chamber), causing rapid release of vapors. This cools the particles very considerably. Heat is supplied at the outside of the vacuum chamber (for example by spraying water over the rotating drum). The agitation provides rapid heat transfer and rapid vaporization, keeping the particles at a low temperature. The process may be either batch or continuous.

The patent (U. S. 2,616,604) claims many advantages:

- Drying times can be reduced by a factor between 10 and 60.
- The product may be obtained in the desired granular, flake or powdered form without grinding.
- Little damage occurs to the product because of the reduced drying time, reduced temperature, and because preliminary degassing is not required.
- Very low water content can be achieved in the final product.
- The process can be carried out continuously.



Rotating Screen Acts Like Ball Mill, Crushing Rolls

Here is something new in size reduction equipment: A screening mill. It's an apparatus that combines some of the features of a rotating screen, ball mill and crushing rolls.

Here's how it works (see cut): Material to be broken up is placed in a rotating screen with baffles on its wall and balls within it. The baffles lift some of the material to the top of the screen. The balls do some grinding with what's essentially a ball-mill effect.

Finally, material reaching the top is fed between a pair of crushing rolls for further reduction. This invention is disclosed by C. L. Sidwell and T. R. Sidwell in U. S. 2,612,321.

You can get copies of any patents, including those mentioned here, by ordering from the Commissioner of Patents, Washington 25, D. C. They cost 25¢ each. Do not send stamps.

PARTIAL LIST OF

materials processed

IN SPROUT-WALDRON UNITS

HARD & FRIABLE

ABRASIVES
AMMONIUM CHLORIDE
BAUXITE
GLASS
BETA-NAPHTHYLAMINE
BEANS
CANDY (HARD)
CHALK
CHARCOAL
COKE
DRIED GELATIN
GLUE
SINTERED IRON OXIDE
LIME
SELENIUM
RESINS
WOOD ROSIN
WELDING FLUX
HARD RUBBER
PHONOGRAPH RECORDS

COAL TAR PITCH
CLAM & OYSTER SHELLS
COCONUT SHELLS
CRACKERS
DOG BISCUITS
EGG SHELLS
FLOOR TILE
PLASTIC SCRAP
MILL SCALE
SALT
SODIUM NITRATE
MANGANESE DIOXIDE
TRI CALCIUM PHOSPHATE
GRAPHITIC SCHIST

SOFT & PLIABLE

CORK
FRUIT SKINS
PARA-DICHLOROBENZENE
SPONGE RUBBER
ASPHALT SHINGLES
NATURAL SPONGES
WAXES
GASKET SCRAP
RAISINS
SOFT RUBBER PRODUCTS
PLASTIC SCRAP
TIRE SCRAP
GRAINS
VEGETABLES
LINOLEUM
BENZENE HEXACHLORIDE
FILTER PRESS CAKE
SPICES
WHEY
YEAST
DDT

FIBROUS

ALPHA PULP
ALFALFA
ANIMAL GLANDS
ALKALI CELLULOSE
BARK
BEET PULP
BAGASSE
ASBESTOS
BARBASCO ROOT
COTTON
FELT
FLAX
FIBERBOARD
FIBERGLAS
HEMP
GLASS WOOL
KAPOK
JUTE
LEATHER
PEAT MOSS
PALMETTO
RAG CLIPPINGS
ROPE & STRING
RAMIE
TIRE FIBER
RUG SCRAPS
WOOD CHIPS
TOBACCO
WASTE YARN
NYLON FIBERS
RAYON FIBERS

SOLIDS & LIQUIDS

MOLASSES FEEDS
ACETIC ACID—SODIUM ACETATE
STARCH & HYDROCHLORIC ACID
INSECTICIDE BLENDS
POWDERED HAND SOAP FORMULAS
ANILINE SLUDGE—WATER
CEROUS HYDROXIDE—WATER
CLAY—WATER
COTTONSEED MEAL—MOLASSES
FERTILIZER—WATER
MOLYBDIC OXIDE—OIL
VANADIC OXIDE—OIL
PEAT MOSS—MINERAL OIL
SEWAGE SLUDGE—WATER
SUGAR—STARCH—WATER
AMMONIUM CHLORIDE—WATER
TITANIUM DIOXIDE—MOLASSES
SULFUR—PINE TAR
ALUMINUM OXIDE—CATALYST SOLUTION

SPROUT-WALDRON
SPECIAL FACILITIES
• Fabricating • Machining
• Custom Founding • Woodworking
• Laboratory Testing

FOR ADDRESS SEE →

WE MAKE

molehills

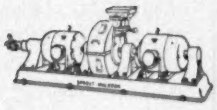
OUT OF

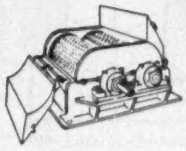
mountains

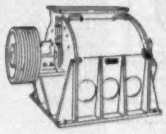
SPROUT-WALDRON

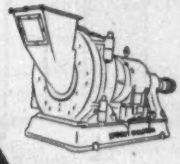
EQUIPMENT AND SYSTEMS FOR

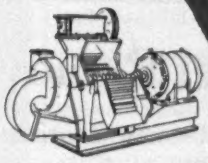
- GRINDING
- CUTTING
- RUBBING
- TEARING
- CURLING
- HULLING
- CRUSHING
- FLAKING, ETC.

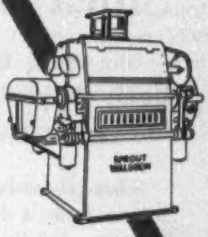












No matter how simple or complex your size reduction problem is, chances are Sprout-Waldron can solve it. There is a wide variety of standard Sprout-Waldron size reduction machines. They perform an amazingly large number of operations. Their field of application extends over a great range of materials, particle sizes and densities. Crushing oyster shells, granulating charcoal, grinding spices, flocking alpha pulp, cracking beans, shredding tin cans are a few of the many applications.

To further increase the versatility of the standard units, Sprout-Waldron *adaptioneers* or modifies them to meet many specialized requirements. And finally, the various machines can be combined in series, to perform the most complex "unit operations."

Sprout-Waldron equipment is being used to perform thousands of difficult size reduction jobs in plants in the processing and other industries today. Why not check the list of materials on the adjoining page? If you are processing any of these, or similar, materials, here is what Sprout-Waldron offers you: 1. *Equipment covering a wide scope of processes and applications.* 2. *A broad background of experience in solving many types of processing problems.* 3. *Complete facilities for engineering, pilot testing and fabrication.* Write to Sprout-Waldron & Co., Inc., 15 Logan St., Muncy, Pennsylvania.

SPROUT-WALDRON

Manufacturing Engineers

MUNCY • PENNSYLVANIA

MODERN EQUIPMENT
for:

- SIZE REDUCTION
- MIXING & BLENDING
- BULK MATERIALS HANDLING
- PRODUCT CLASSIFICATION
- PELLETING & CUBING

312

• Complete recovery of oxo alcohols can be obtained without heating the bottoms in the reboiler to a temperature high enough to cause thermal decomposition; this is done by adding a liquid diluent that boils 20 to 100 deg. F. above the boiling point of the alcohol in the reboiler (James E. Moise, Joseph S. Anderson and Frank B. Johnson in U. S. 2,614,071).

• The interfering effects of aldehydes on the distillation of oxo products can be avoided by the simple expedient of changing the pH of the aqueous layer from about 4 to the basic side. This converts the aldehydes to higher-boiling aldolization products—thus eliminates azeotropes formed by the aldehydes and prevents the aldehydes from reacting with alcohols to form the less desirable acetals (Carl S. Carlson and Paul V. Smith in U. S. 2,614,072).

Separation Through Nonporous Membranes

Nonporous rubber membranes about 0.01 in. thick are used to separate hydrocarbons from nonhydrocarbons by diffusion in a multistage diffusion cascade. The process, described in U.S. 2,617,493, by Jean P. Jones, is assigned to Philips Petroleum Co.

The hydrocarbons dissolve in the membrane, diffuse through it, and are released on the other side. Many cascades in series bring about the desired separation.

This operation is preferably carried out in the gas phase, but can be conducted in the liquid phase. A pressure differential is maintained across each membrane by means of pumps or compressors. The rubber membranes are supported by a backing such as a wire screen or a porous ceramic wall.

While the arrangement of stages in this cascade is essentially identical with the "diffusion" cascades used for separating uranium isotopes, the process is entirely different in principle. The uranium isotope separation process is actually a molecular effusion of molecules through minute openings in a barrier, while the present process involves actual diffusion through a nonporous membrane.

The process is said to be useful for the removal of such materials as nitrogen, oxygen, water, volatile mercaptans and hydrogen sulphide from hydrocarbon materials.

Your Checklist of New Equipment Patents

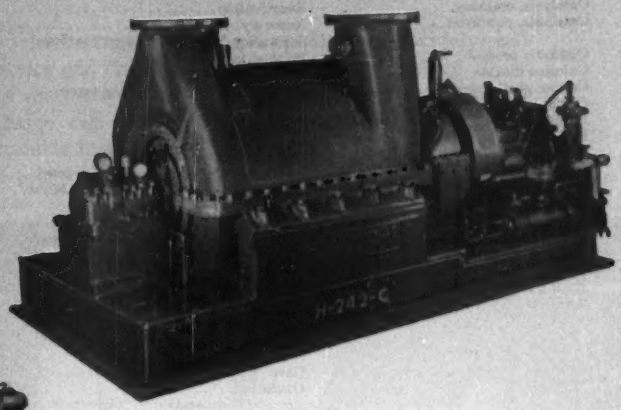
Operation . . .	About . . .	Inventor or Assignee . . .	Patent No. .
Condensation	Partial condensation of vapors	Compagnie Francaise de Raffinage	2,617,758
Crushing	Breaker bar screen for hammer crushers	The Jeffrey Manufacturing Co	2,618,438
Crystallization	Crystallizer for concentrating water solutions	Joachim Schmidt	2,617,274
Diffusion	Frame diffusion apparatus	Koppers Co., Inc	2,618,357
Distillation	Short-path fractionating centrifugal still	Metropolitan-Vickers Electrical Co. Ltd	2,617,760
Extraction	Juice and oil extraction press	The Sharples Co	2,617,354
Filtration	All-vinyl resin filter media	American Viscose Corp	2,615,477
	Horizontal plate filter	Aloysius C. Kracklauer	2,615,574
	Continuous rotary filter	Arthur Wright	2,615,575
Gas-liquid contactors	Dispersion of gases in liquids	Patterson Foundry and Machine Co	2,615,607-8
Gas-solid contactors	Fluidised solids-gas contactor	Shell Development Co	2,617,708
Gas-solid separation	Electrostatic precipitator	Westinghouse Electric Corp	2,615,529
	Liquid-cleaned precipitator	Air Preheater Corp	2,615,530
	Electrofilter for gases	AB Svenska Flaktfabriken	2,616,516
	Multiple centrifugal dust separator	Waagner-Biro Aktiengesellschaft	2,616,520
Heat exchangers	Coiled heat exchanger	Servel, Inc	2,615,686
	High-temperature operation of shell-and-tube type	Diamond Alkali Co	2,615,688
	Heat exchanger	American Blower Corp	2,615,687
	Pebble heating chamber	Phillips Petroleum Co	2,615,703
	Folded metal strip heat exchanger	Hartford National Bank & Trust Co	2,616,530
	Regenerator filling material	Hartford National Bank & Trust Co	2,616,668
	Plate heat exchanger	The Creamery Package Manufacturing Co	2,616,671
	Control of pebble heater operations	Babcock & Wilcox Co	2,616,628
	Heat exchanger for fluids at different pressures	George Jendrassik	2,617,634
Instrumentation and Control	Liquid-level indicator	Foster-Wheeler Corp	2,615,338
	Combined stirrer and hydrometer	Melvin F. Nace	2,616,287
	Fluid proportioning apparatus	Lindley E. Mills	2,618,510
Liquid-liquid separation	Apparatus for separating oil emulsions	Forrest Lee Murdock, Sr	2,615,528
Mixing	Heated mixer	C. A. Olcott	2,616,660
Reactors	Fluid catalytic reactor	Standard Oil Development Co	2,615,796
	Fluid catalytic reactor	Hydrocarbon Research, Inc	2,616,914
	Catalytic recovery of sulphur from gases containing H_2S	Jefferson Lake Sulphur Co	2,617,718
	Catalyst stripping	Shell Development Co	2,618,074
	Alkylation	Sinclair Refining Co	2,618,534
	Removing combustible deposits from finely divided solids	Shell Development Co	2,618,535
Solid-liquid separation	Spiral separator for liquids or solids	Edwin T. Hodge	2,615,572
	Centrifugal classifier	American Development and Distributing Co	2,616,563

. . . And New Process Patents

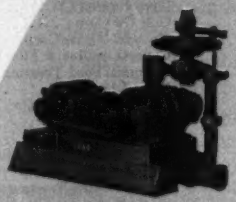
Product or Process . . .	About . . .	Inventor or Assignee . . .	Patent No. .
Air	Separation by distillation	Union Carbide & Carbon Corp	2,615,312
	Separation by distillation	Petrocarbon, Ltd	2,617,272
	Separation by low temperature distillation	M. W. Kellogg Co	2,617,275
Alcohol	Purification of high proof	Joseph E. Seagram & Sons, Inc	2,618,590
	Oxidation to aldehydes with sulphur compounds	E. I. du Pont de Nemours & Co	2,618,660
	Ketone-containing, azeotropic distillation	Stanolind Oil & Gas Co	2,617,757
Alkali metals	Electrolytic production	G. & W. H. Corson, Inc	2,615,838
	Purification of borohydrides	Metal Hydrides, Inc	2,615,788
Alkyd resins	Preparation of oil-modified type	American Cyanamid Co	2,618,617
Alkylation	Two-stage process	Sinclair Refining Co	2,618,669
Amyl nitrate	Manufacture	Ethyl Corp	2,618,650

(Continued)

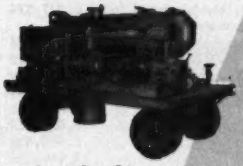
LET *Specialists* DO THE JOB OF MOVING GAS OR AIR



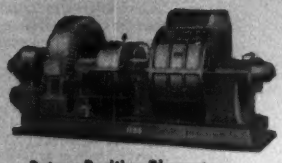
CENTRIFUGAL BLOWERS AND EXHAUSTERS
single and multi-stage units, in capacities from 2,000 cfm to 100,000 cfm or higher, at maximum practical pressures.



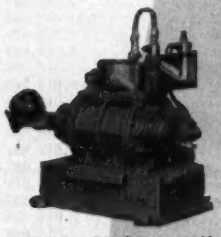
Rotary Positive Gas Pumps
5 cfm to 50,000 cfm.



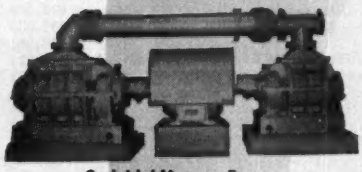
Inert Gas Generators
1,000 cfh to 35,000 cfh.



Rotary Positive Blowers and Exhausters
5 cfm to 50,000 cfm.



Positive Displacement Meters
4,000 cfh to 1,000,000 cfh.



Cycloidal Vacuum Pumps
500 cfm to 13,000 cfm.

One advantage of dealing with Roots-Connersville for blowers, exhausters, meters and related equipment is that we are specialists in this field. It's been our only business for almost a century. Today, we combine this long experience with up-to-the-minute thinking, to supply the most reliable and economical machine for your specific job.

Then, there's the wide versatility of R-C equipment. Our exclusive *dual-ability* line includes Centrifugal and Rotary Positive types, in standard sizes for most work. Because we build both, our recommendations are unbiased.

In our Rotary Positive Gas and Vacuum Pumps and Meters, and in Inert Gas Generators, there's a similar, wide choice in types and capacities, closely matched to specific needs.

We suggest that on *any* problem of handling gas or air at moderate pressure, for industrial purposes, you ask us for definite recommendations. Detailed bulletins are available on request.

ROOTS-CONNERSVILLE

Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER A DIVISION OF DRESSER INDUSTRIES, INC.
253 Illinois Ave. • Connersville, Indiana

• Complete recovery of oxo alcohols can be obtained without heating the bottoms in the reboiler to a temperature high enough to cause thermal decomposition; this is done by adding a liquid diluent that boils 20 to 100 deg. F. above the boiling point of the alcohol in the reboiler (James E. Moise, Joseph S. Anderson and Frank B. Johnson in U. S. 2,614,071).

• The interfering effects of aldehydes on the distillation of oxo products can be avoided by the simple expedient of changing the pH of the aqueous layer from about 4 to the basic side. This converts the aldehydes to higher-boiling aldolization products—thus eliminates azeotropes formed by the aldehydes and prevents the aldehydes from reacting with alcohols to form the less desirable acetals (Carl S. Carlson and Paul V. Smith in U. S. 2,614,072).

Separation Through Nonporous Membranes

Nonporous rubber membranes about 0.01 in. thick are used to separate hydrocarbons from nonhydrocarbons by diffusion in a multistage diffusion cascade. The process, described in U. S. 2,617,493, by Jean P. Jones, is assigned to Philips Petroleum Co.

The hydrocarbons dissolve in the membrane, diffuse through it, and are released on the other side. Many cascades in series bring about the desired separation.

This operation is preferably carried out in the gas phase, but can be conducted in the liquid phase. A pressure differential is maintained across each membrane by means of pumps or compressors. The rubber membranes are supported by a backing such as a wire screen or a porous ceramic wall.

While the arrangement of stages in this cascade is essentially identical with the "diffusion" cascades used for separating uranium isotopes, the process is entirely different in principle. The uranium isotope separation process is actually a molecular effusion of molecules through minute openings in a barrier, while the present process involves actual diffusion through a nonporous membrane.

The process is said to be useful for the removal of such materials as nitrogen, oxygen, water, volatile mercaptans and hydrogen sulphide from hydrocarbon materials.

Your Checklist of New Equipment Patents

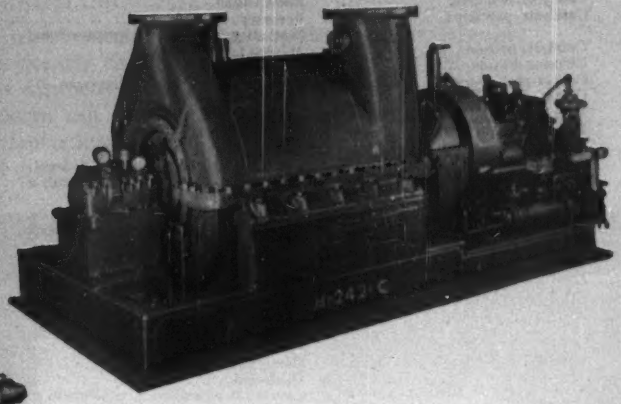
Operation . . .	About . . .	Inventor or Assignee . . .	Patent No. .
Condensation	Partial condensation of vapors	Compagnie Francaise de Raffinage	2,617,758
Crushing	Breaker bar screen for hammer crushers	The Jeffrey Manufacturing Co	2,618,438
Crystallization	Crystalliser for concentrating water solutions	Joachim Schmidt	2,617,274
Diffusion	Frame diffusion apparatus	Koppers Co., Inc	2,618,357
Distillation	Short-path fractionating centrifugal still	Metropolitan-Vickers Electrical Co. Ltd	2,617,760
Extraction	Juice and oil extraction press	The Sharples Co	2,617,354
Filtration	All-vinyl resin filter media	American Viscose Corp	2,615,477
	Horisontal plate filter	Aloysius C. Kracklauer	2,615,574
	Continuous rotary filter	Arthur Wright	2,615,575
Gas-liquid contactors	Dispersion of gases in liquids	Patterson Foundry and Machine Co	2,615,697-8
Gas-solid contactors	Fluidized solids-gas contactor	Shell Development Co	2,617,708
Gas-solid separation	Electrostatic precipitator	Westinghouse Electric Corp	2,615,529
	Liquid-cleaned precipitator	Air Preheater Corp	2,615,530
	Electrofilter for gases	AB Svenska Flaktfabriken	2,616,516
	Multiple centrifugal dust separator	Waagner-Biro Aktiengesellschaft	2,616,520
Heat exchangers	Coiled heat exchanger	Servel, Inc	2,615,686
	High-temperature operation of shell-and-tube type heat exchanger	Diamond Alkali Co	2,615,688
	Pebble heating chamber	American Blower Corp	2,615,687
	Folded metal strip heat exchanger	Phillips Petroleum Co	2,615,703
	Regenerator filling material	Hartford National Bank & Trust Co	2,616,530
	Plate heat exchanger	Hartford National Bank & Trust Co	2,616,668
	Control of pebble heater operations	The Creamery Package Manufacturing Co	2,616,671
	Heat exchanger for fluids at different pressures	Babcock & Wilcox Co	2,616,628
Instrumentation and Control	Liquid-level indicator	George Jendrassik	2,617,634
	Combined stirrer and hydrometer	Foster-Wheeler Corp	2,615,338
	Fluid proportioning apparatus	Melvin F. Nace	2,616,287
Liquid-liquid separation	Apparatus for separating oil emulsions	Lindley E. Mills	2,618,510
Mixing	Heated mixer	Forrest Lee Murdock, Sr	2,615,528
Reactors	Fluid catalytic reactor	C. A. Olcott	2,616,669
	Fluid catalytic reactor	Standard Oil Development Co	2,615,796
	Catalytic recovery of sulphur from gases containing H_2S	Hydrocarbon Research, Inc	2,616,914
		Jefferson Lake Sulphur Co	2,617,718
	Catalyst stripping	Shell Development Co	2,618,074
	Alkylation	Sinclair Refining Co	2,618,534
	Removing combustible deposits from finely divided solids	Shell Development Co	2,618,535
Solid-liquid separation	Spiral separator for liquids or solids	Edwin T. Hodge	2,615,572
	Centrifugal classifier	American Development and Distributing Co	2,616,563

. . . And New Process Patents

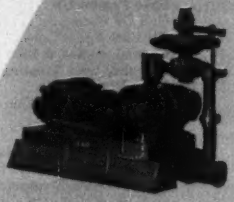
Product or Process . . .	About . . .	Inventor or Assignee . . .	Patent No. .
Air	Separation by distillation	Union Carbide & Carbon Corp	2,615,312
	Separation by distillation	Petrocarbon, Ltd	2,617,272
	Separation by low temperature distillation	M. W. Kellogg Co	2,617,275
Alcohol	Purification of high proof	Joseph E. Seagram & Sons, Inc	2,618,590
	Oxidation to aldehydes with sulphur compounds	E. I. du Pont de Nemours & Co	2,618,660
	Ketone-containing, azeotropic distillation	Stanolind Oil & Gas Co	2,617,757
Alkali metals	Electrolytic production	G. & W. H. Corson, Inc	2,615,838
	Purification of borohydrides	Metal Hydrides, Inc	2,615,788
Alkyd resins	Preparation of oil-modified type	American Cyanamid Co	2,618,617
Alkylation	Two-stage process	Sinclair Refining Co	2,618,669
Amyl nitrate	Manufacture	Ethyl Corp	2,618,650

(Continued)

LET *Specialists* DO THE JOB OF MOVING GAS OR AIR

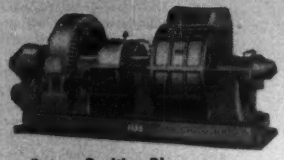


CENTRIFUGAL BLOWERS AND EXHAUSTERS
single and multi-stage units, in capacities from 2,000 cfm to 100,000 cfm or higher, at maximum practical pressures.



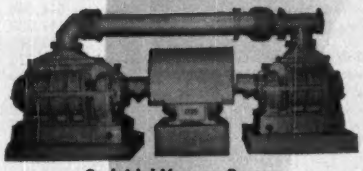
Rotary Positive Gas Pumps
5 cfm to 50,000 cfm.

Inert Gas Generators
1,000 cfh to 35,000 cfh.



Rotary Positive Blowers and Exhausters
5 cfm to 50,000 cfm.

Positive Displacement Meters
4,000 cfh to 1,000,000 cfh.



Cycloidal Vacuum Pumps
500 cfm to 13,000 cfm.

One advantage of dealing with Roots-Connersville for blowers, exhausters, meters and related equipment is that we are specialists in this field. It's been our only business for almost a century. Today, we combine this long experience with up-to-the-minute thinking, to supply the most reliable and economical machine for your specific job.

Then, there's the wide versatility of R-C equipment. Our exclusive *dual-ability* line includes Centrifugal and Rotary Positive types, in standard sizes for most work. Because we build both, our recommendations are unbiased.

In our Rotary Positive Gas and Vacuum Pumps and Meters, and in Inert Gas Generators, there's a similar, wide choice in types and capacities, closely matched to specific needs.

We suggest that on *any* problem of handling gas or air at moderate pressure, for industrial purposes, you ask us for definite recommendations. Detailed bulletins are available on request.

ROOTS-CONNERSVILLE

Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER A DIVISION OF DRESSER INDUSTRIES, INC.
253 Illinois Ave. • Connersville, Indiana

New Process Patents, cont. . .

Product or Process . . .	About . . .	Inventor or Assignee . . .	Patent No. . .
Bone-char	Reactivation	Refined Syrups & Sugars, Inc	2,616,858
Calcium carbonate	Production from waste kiln gases	Robert W. McAllister	2,617,711
Carbon black	Manufacture	Phillips Petroleum Co	2,616,794–5
	Production	Phillips Petroleum Co	2,617,714
	Manufacture	Union Oil Co	2,618,533
Carbon dioxide	Removal from hydrocarbon synthesis tail gas	Standard Oil Development Co	2,615,909
Carboxylic acids	Purification of synthetic oil-soluble types	Stanolind Oil & Gas Co	2,615,912
Casein	Production	Amino Acids, Inc	2,618,629
Castor oil	Solvent extraction from castor seed	Baker Castor Oil Co	2,616,907–9
Catalysts, cracking	Reactivation	Standard Oil Development Co	2,618,613
Catalysts, powdered	Recovery	M. W. Kellogg Co	2,615,785
	Separation from gaseous hydrocarbons	Gyro Process Co	2,614,659
Catalytic process	Method in fluidized beds	Gulf Oil Corp	2,617,709
Chlorine dioxide	Manufacture	Novadel-Agene Corp	2,616,792
Copper phthalocyanine	Production, non-crystallizing types	General Aniline & Film Corp	2,618,642
Cotton seed	Delinting	Chemical Seed Treating & Delinting Corp	2,618,103
Emulsions, water-in-oil	Breaking	Visco Products Co	2,615,853
Ethylene oxide	Aldehyde-free production	Jefferson Chemical Co., Inc	2,615,901
Fertilizers, mixed	Manufacture	Swift & Co	2,618,546–7
Fibrous cellulose	Rendering derivatives easily powdered	British Celanese, Ltd	2,618,018
Fischer-Tropsch catalyst	Preparation from iron-silica gel catalyst	Ruhrchemie Aktiengesellschaft, Oberhausen-Holten and Lurgi Gesellschaft fur Warmetechnik m.b.H.	2,617,774
Glycerine	Purification	Illinois Water Treatment Co	2,615,924
H_2-CO gas mixtures	Catalytic conversion to hydrocarbons	U. S. A.	2,617,816
	Conversion to synthetic hydrocarbons	Standard Oil Development Co	2,615,910
H_2S	Removal from gases	Shell Development Co	2,615,787
Hydrocarbons	Desulphurizing mixtures with nickel carbonyl	Socony-Vacuum Oil Co., Inc	2,615,831
	Adsorption	Union Oil Co	2,616,515
	Adsorption	Union Oil Co	2,616,829
	Sweetening & gum treating distillates	Universal Oil Products Co	2,616,833
	Removing mercaptans	Standard Oil Development Co	2,616,835
	Catalytic Cracking	Standard Oil Development Co	2,616,836
	Oxidation	M. W. Kellogg Co	2,616,898
	Liquid-gas separation by retrograde condensation	Union Oil Co.; Black, Sivalls & Bryson, Inc	2,617,276
	Liquids, separation from petroleum	Judson S. Swearingen	2,617,484
	Catalytic dehydrogenation	Phillips Petroleum Co	2,618,667
Iron oxide, red	Production	Imperial Chemical Industries Ltd	2,618,532
	Production of pigments	Imperial Chemical Industries Ltd	2,618,571
Isoquinoline	Isolation from quinaldine & quinoline	Allied Chemical & Dye Corp	2,618,639
Metals	Distillation	Broken Hill Assoc. Smelters Proprietary, Ltd	2,615,706
Mercaptans	Production of high boiling types	Standard Oil Co. (Ind.)	2,615,786
Nitriles	Distillation	M. W. Kellogg Co	2,616,838
Novolak resins	Production	Hartford National Bank & Trust Co	2,616 872
Oils and fats	Solvent extraction	Blaw-Knox Co	2,618,560
Olefins	Recovery from gases	The Texas Co	2,617,839
	Polymerization	Shell Development Co	2,618,622
Organics	Synthesis from H_2-CO	M. W. Kellogg Co	2,615,911
Organosilicon compounds	Production	Libbey-Owens-Ford Glass Co	2,618,646–7
Oxo alcohols	Purification by distillation	Standard Oil Development Co	2,614,128
Oxo synthesis	Production of esters	Shell Development Co	2,618,649
Ozone	Generation	Air Reduction Co	2,615,841
Petrolatum	Refining	M. W. Kellogg Co	2,616,830
Petroleum	Desulphurization of distillates	Sun Oil Co	2,616,834
	Desulphurization	Wigton-Abbott Corp	2,618,586
	Catalytic cracking	Standard Oil (Indiana)	2,614,068
Phenols	Desulphurization	Socony-Vacuum Oil Co., Inc	2,617,833
	Isolation using hexamethylene tetramine	The Texas Co	2,618,664–6
Phosphoric acid catalyst	Preparation of copper containing types	Universal Oil Products Co	2,618,614
Phosphorus	Oxidation with steam	Tennessee Valley Authority	2,613,134–5
Phthalates	Preparation of dimethyl- & diethyl-	Celanese Corp	2,618,651
Pickle liquor waste	Electrolytic recovery of byproducts	Gerald J. Horvita	2,618,592
Polyether alcohols	Production	General Aniline & Film Corp	2,618,633
Poly-n-vinyl pyrrole	Molding	General Aniline & Film Corp	2,618,020
Potassium salts	Extraction from dilute solutions	A/S Norduco	2,617,710
Propane dewaxing	Chilling propane-oil-wax solutions	Standard Oil (Indiana)	2,614,065
Propionaldehyde	Recovery by azeotropic distillation	Stanolind Oil & Gas Co	2,617,756
Rubber	Softening	American Cyanamid Co	2,618,620
Salts	Separation by flotation	Potash Co. of America	2,613,132
Separation of gases	Adsorption with charcoal	Standard Oil Development Co	2,614,657
Shale	Fluidized distillation & continuous retorting	Standard Oil Development Co	2,618,588–9
Silica-gel	Forming into strong tablets	Standard Oil Development Co	2,618,615
Sodium chlorophenate	Manufacture	Mathieson Chemical Corp	2,615,923
Soluble salts	Mining method	Diamond Alkali Co	2,618,475
Solvents	Recovery	M. W. Kellogg Co	2,616,912
	Treatment with boiling liquid in a still	Blaw-Knox Co	2,614,073
Sulphate ash	Recovery from exhaust gases	Research Corp	2,614,651
Sulphur	Vaporization and superheating	Pure Oil Co	2,617,717
Synthesis catalyst	Stabilization of fluidized iron type	The Texas Co	2,616,915
Synthesis gas	Production from steam & a hydrocarbon	M. W. Kellogg Co	2,618,542
	Production by oxidation of light hydrocarbon	Phillips Petroleum Co	2,618,543
	Production	Phillips Petroleum Co	2,618,611
	Manufacture	Gulf Research & Development Co	2,614,915
	Production	Gulf Research & Development Co	2,613,145
Synthetic gasoline	Treatment	Phillips Petroleum Co	2,615,036
Titanium	Production of iron-free arsenate	Glidden Co	2,615,789
	Production from—tetrachloride	Kennecott Copper Co	2,618,549–50
	Superheating of tetrachloride	E. I. du Pont de Nemours & Co	2,614,028
Urea-formaldehyde	Cast products from condensate	Happe Products, Ltd	2,618,017
Vinyl chloride resins	Dispersion in plasticizers	Union Carbide & Carbon Corp	2,618,621
Vinyl ethers	Preparation	Montecatini Societa Generale per l'Industria Mineraria E Chimica Anonima	2,617,829
	Production	Koppers Co	2,615,050
Water gas	Production	Standard Oil Development Co	2,618,544
	Production of sulphur-free gas	Standard Oil Development Co	2,614,038
Wax	Continuous vacuum crystallization	Texaco Development Co	2,612,466
Zirconium tetrachloride	Purification of vapors	Robert H. Lindblad & Sven Christian Pyk	2,618,831

here's why

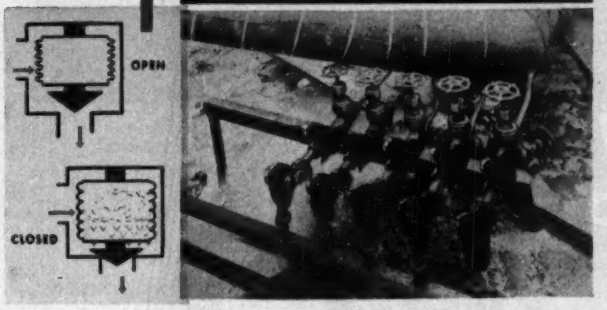
they selected 4 different types of steam traps for 4 different applications

CONDITIONS under which steam traps must operate vary widely, but there is for every service one type that gives maximum efficiency.

Sarco makes the 4 distinctly different TYPES of steam traps shown below. Therefore, Sarco can give you *impartial* advice on the best choice for your particular installation.

For each of the 4 jobs listed below, the users selected four different TYPES of Sarco traps.

CASE NO. 1 — Draining outside tracer lines in an oil refinery in New Jersey



Type of traps installed: Sarco No. 9 thermostatic traps.

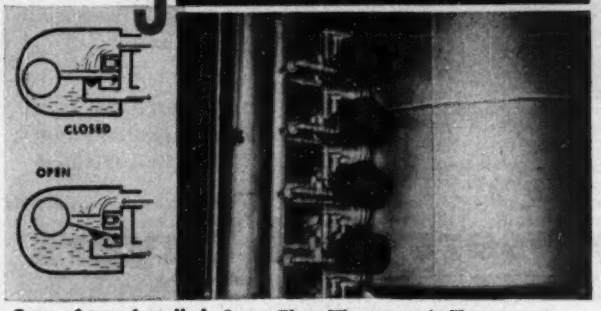
Why selected: Being thermostatic, they are steam misers. Can't freeze, being wide open when cold. Easy to maintain since only the bellows moves. Small, light and easy to install. Self-adjusting for different pressures.

CASE NO. 2 — Draining platens of compression plastic presses

Type of traps installed: 100 Sarco Inverted Bucket traps in service for 17 years.

Why selected: Press platens have small horizontal steam spaces; the intermittent blast discharge of these Sarco traps scours the heating surface. Built-in strainer cuts maintenance costs.

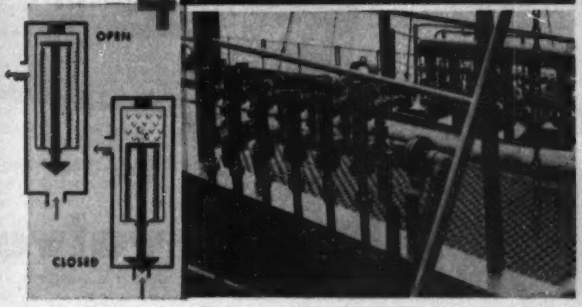
CASE NO. 3 — Draining heating coils of a milk evaporator



Type of trap installed: Sarco Float-Thermostatic Trap.

Why selected: Heating surfaces of the coils must be kept full of live steam—this Sarco trap discharges condensate as it collects. Can't airbind because the integral thermostatic vent gets rid of air, regardless of operating steam pressure and temperature. As shown in sketch 3 above, this vent does *not* depend upon the discharge of condensate.

CASE NO. 4 — Draining heating coils on an oil tanker



Type of traps installed: Sarco LIQUID EXPANSION traps No. 871.

Why selected: Traps on tankers are exposed to freezing weather and vibration. Sarco's No. 871 traps can't freeze; resist vibration, water-hammer, pressure pulsations and superheat. These traps discharge condensate at adjustable temperatures below 212°F., permitting use of some of the condensate's sensible heat.

● Write today for Bulletin No. 145-A: *Selecting the Right TYPE Steam Trap.* Sarco Company, Inc., Empire State Bldg., New York 1, N. Y. Represented in principal cities. Sarco Canada Ltd., Toronto 8, Ontario.

408

SARCO saves steam

improves product quality and output

FREE..to valve users and buyers

MAIL THIS COUPON TO...

THE OHIO INJECTOR COMPANY
111 MAIN STREET
WADSWORTH, OHIO

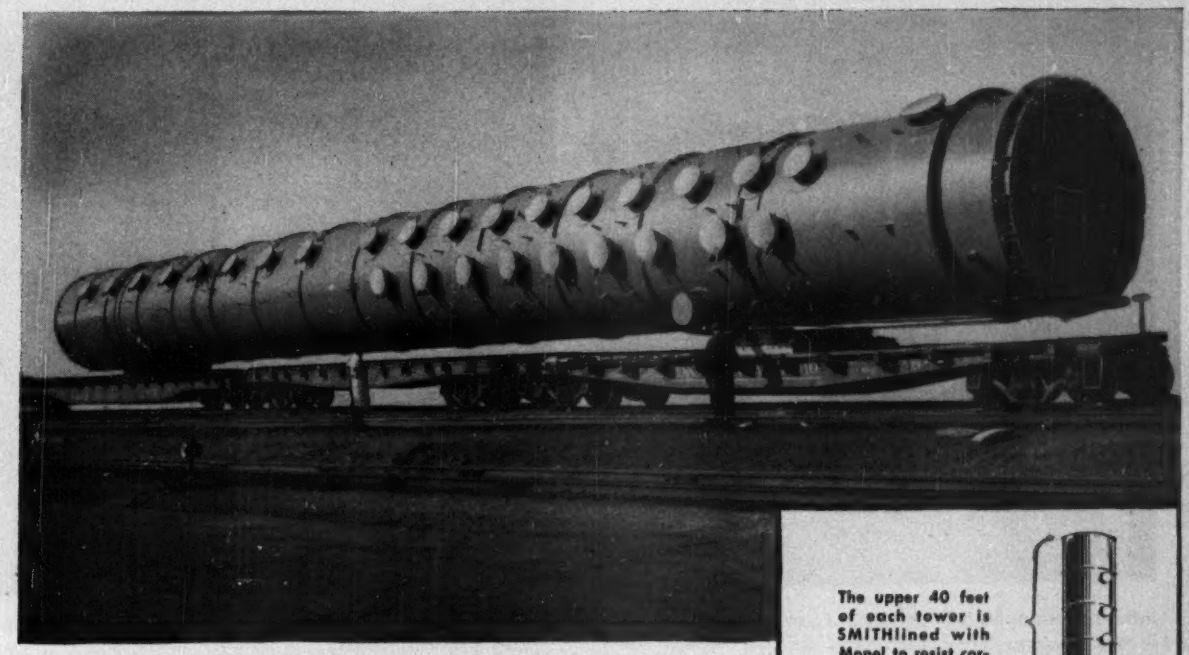
Please send me a copy of the new booklet, "OIC Catalog Digest for Quick Valve Selection".

Name_____ Title_____

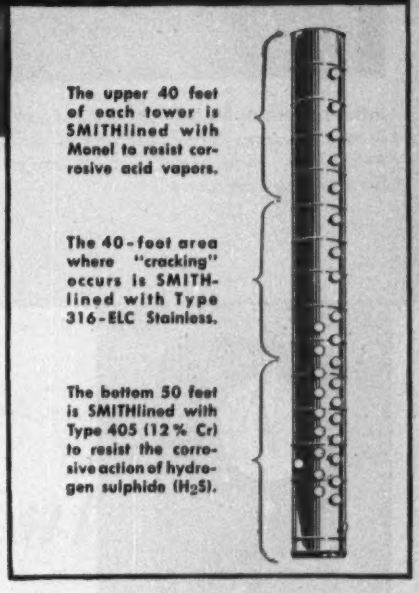
Company_____

Address_____

_____



First of two atmospheric towers erected in The Standard Oil Refinery, No. 1, Cleveland, Ohio, each 130 feet high, 13 feet O.D. including nozzles and manways, and weighing 200,000 pounds.


The upper 40 feet of each tower is SMITHlined with Monel to resist corrosive acid vapors.
The 40-foot area where "cracking" occurs is SMITHlined with Type 316-ELC Stainless.
The bottom 50 feet is SMITHlined with Type 405 (12% Cr) to resist the corrosive action of hydrogen sulphide (H_2S).

THREE-STAGE atmospheric tower FOR SOHIO

A. O. Smith Process of "Smithlining" Permits Three Selective Linings in a Single Vessel

The economical solution of varying corrosion conditions in a single vessel is exemplified in the construction of two unusual atmospheric towers for The Standard Oil Refinery No. 1, Cleveland, Ohio.

Three types of lining, each specific for the corrosion condition in each of the three stages in the tower, were selected and bonded to the carbon steel structure by the A. O. Smith process of Smithlining.

Smithlining is the closely controlled resistance welding process of inseparably bonding alloy sheets to carbon steel vessel walls. Most alloys can be applied by this process. All liner materials can be rigidly inspected as to gauge requirements, surface finish, chemical analysis, mechanical properties and corrosion requirements prior to attachment.

The two towers were ordered and erected by Arthur G. McKee & Company of Cleveland, Ohio.

For assurance of superiority in vessel design and construction and for aid in solving vessel application problems, call on A. O. Smith, where the industry's leading laboratory, design and engineering groups are at your service.

Contact the nearest office, listed below, or write to A. O. Smith Corporation, Vessel and Heat Exchanger Division, Dept. CE-253, Milwaukee 1, Wisconsin.

INDUSTRY COMES TO A. O. SMITH
WITH HEAT EXCHANGER PROBLEMS

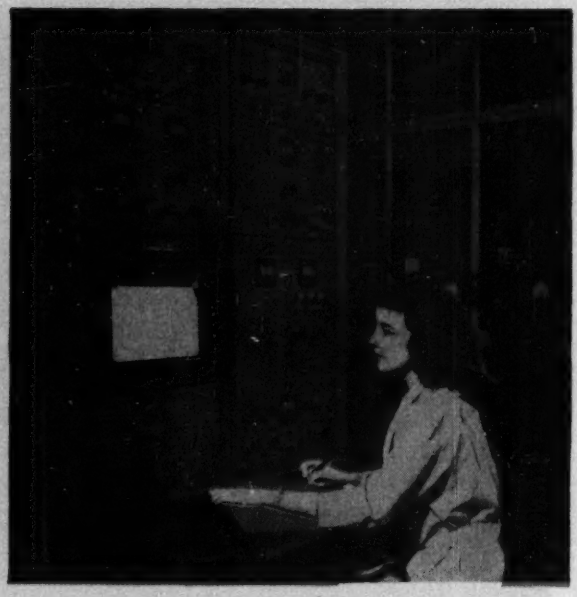
Research and Engineering Building

A.O.Smith

VESSELS • HEAT EXCHANGERS

Chicago 4 • Cleveland 15 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas • New Orleans 12 • New York 17
Pittsburgh 19 • San Francisco 4 • Seattle 1 • Tulsa 3
Washington 6, D.C.
International Division: Milwaukee 1
Licensee in Canada: John Inglis Co., Ltd.

infra-red analysis *tells how much of a selected component exists in gas mixtures. Here, continuous analysis recorded by an ElectroniK potentiometer on a refinery's graphic panel is used for actual process control.*



mass spectrometry *separates materials on the basis of their different molecular weights . . . finds what constituents are present in what quantity. Above is a "package" mass spectrometer in which an ElectroniK instrument records test data.*

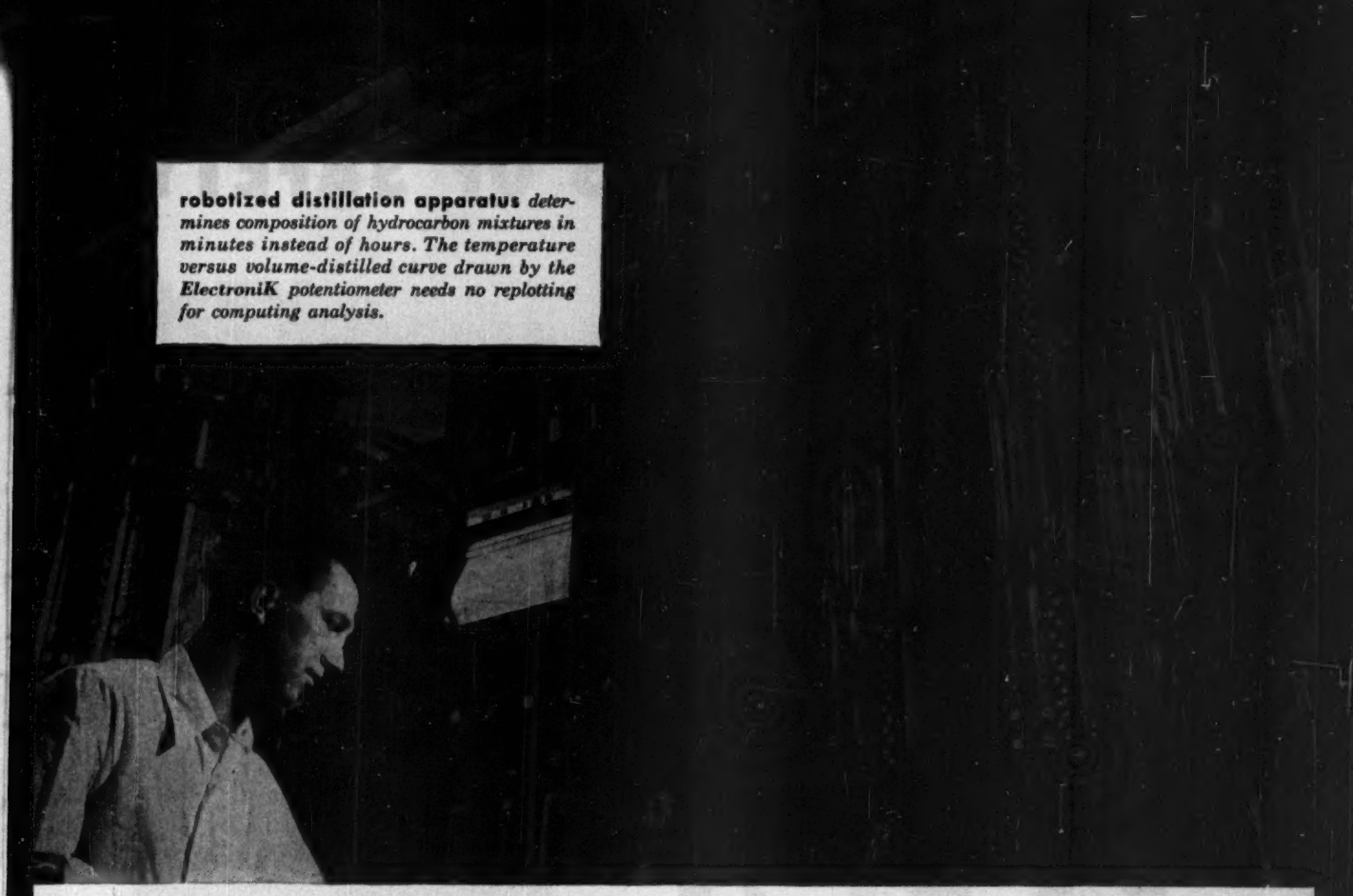
gas analyzer, *operating on the thermal conductivity principle, combines an ElectroniK recorder, analysis cell and accessories in a single panel assembly.*

New concepts *utilize*

These are some of the manufacturers who use *ElectroniK* instruments in their analyzers

Products of the companies checked are illustrated on these pages

Applied Research Laboratories
√ Baird Associates
Bausch and Lomb
Beckman Instruments, Inc.
Consolidated Engineering Corporation
√ Davis Emergency Equipment Co.
√ General Electric Co.
Jarell-Ash
Mine Safety Appliances Co.
North American Philips Co., Inc.
Perkin-Elmer Corp.
√ Podbielniak, Inc.
Precision Scientific Co.
E. H. Sargent & Co.
Tracer Laboratories
Turner-Burrell Technical Supply Co.



robotized distillation apparatus *determines composition of hydrocarbon mixtures in minutes instead of hours. The temperature versus volume-distilled curve drawn by the ElectroniK potentiometer needs no replotting for computing analysis.*

# of process control

ElectroniK instruments

FROM the analytical laboratory comes a new concept of industrial process control, based directly on the desired chemical or physical characteristics of the product.

Continuous analyzers now make it possible to measure composition of gases and liquids accurately and automatically . . . to record this information . . . even to actuate automatic controls. Instead of temperature, pressure and flow, these new systems deal in terms of refractive index, density, ultraviolet and infrared spectra, radiation intensity and absorption.

An essential component of all these systems is automatic recording. To fill this critical function, leading manufacturers of automatic analyzers choose *ElectroniK* instruments. They choose them for their exceptional accuracy, that exploits fully the inherent precision of the new measuring techniques. They choose them, too, for sensitivity that records every essential change in readily readable detail. And they prefer *ElectroniK* recorders for their simple, rugged design that guarantees dependable service under any industrial conditions.

Your local Honeywell engineering representative will be glad to discuss the role of *ElectroniK* instruments in product-analysis systems . . . or in any conventional process control. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for Bulletin 15-14, "Instruments Accelerate Research."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

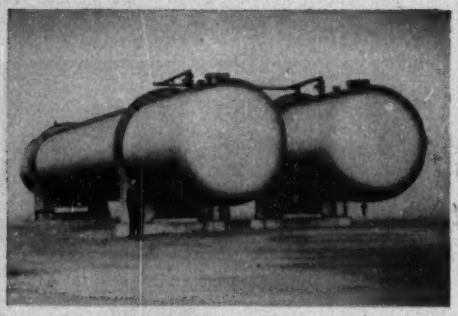
100,000 GALLONS OF SAFETY

The Posey Iron tank illustrated provides 100,000 gallons of *safe* storage because forty-two years of experience went into its fabrication. And the real safety factor in any tank is the sum of its maker's experience . . . skill . . . facilities . . . and shop practices.

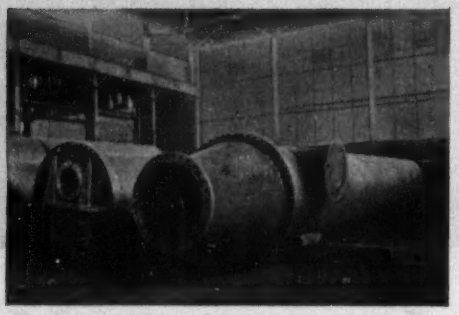
Here are a few of the advantages offered tank users by Posey Iron's knowledge . . . know-how . . . modernized plant . . . and sound practices:

1. Correct size and type of tank is determined by consultation with Posey Iron executives.
2. Posey Iron has the facilities to solve problems of *specialized* fabrication . . . design . . . or maintenance.
3. Posey Iron can help you determine the correct alloys when corrosive materials must be handled.

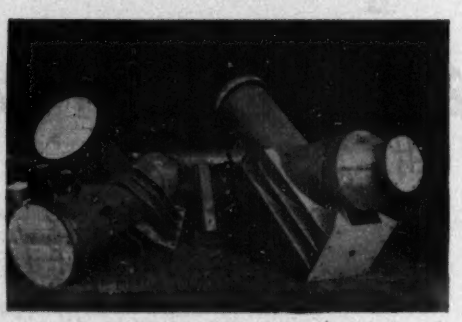
Talk over your steel plate requirements with the Posey Iron Works — where there is forty-two years of sound experience at your service.



Posey Iron Works twin-tank installation for prominent public utility.



72" diameter headers for water intake lines fabricated throughout in our shops.



Alloy Steel Pipe awaiting shipment from the Posey Iron Works.

- **Tanks**
- **Stacks**
- **Digesters**
- **Pipe**
- **Pressure Vessels**
- **General Steel Plate Construction**

Established Since 1910 — New York Office: Graybar Bldg.

POSEY IRON WORKS, INC.

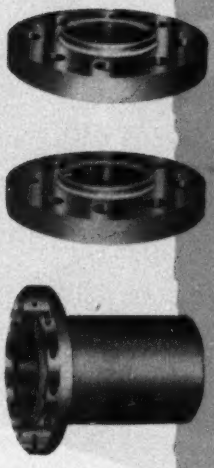
LANCASTER, PENNSYLVANIA

DIVISIONS: BRICK MACHINERY, FOUNDRY, INDUSTRIAL HEATING, IROQUOIS, SHIPBUILDING, STEEL PLATE

KEY-KAST

Alloy Steel Welding Pipe FLANGES

all shapes
sizes
schedules



ENGINEERED FOR LONGER LIFE!

- Controlled quality . . . through rigid metallurgical control . . . produced, inspected and tested in one plant.
- A.S.M.E., A.S.T.M., A.S.A. code.
- Low and intermediate alloys and various stainless steels.
- Lower unit cost . . . plus prompt deliveries.
- Machined surface.

Key-Kast welding fittings...the strongest part of any piping system!

Greater wall thickness throughout — for increased structural strength.

Extra thickness in critical areas —for greater allowance against corrosion and erosion.

key company

Since 1916 . . . manufacturers and developers of products for high temperatures and pressures

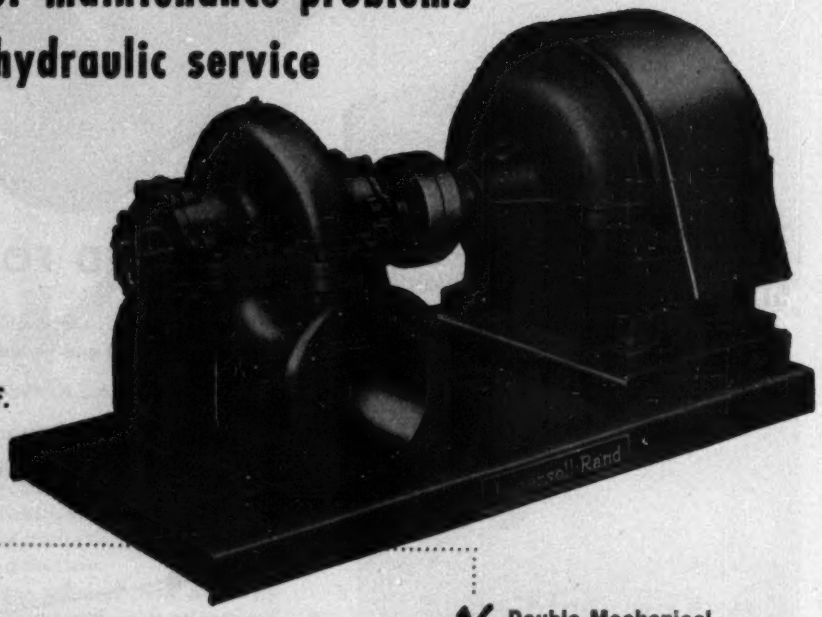
P. O. BOX 494, EAST ST. LOUIS, ILLINOIS

DISTRICT OFFICES: NEW YORK • CLEVELAND
CHICAGO • TULSA • HOUSTON • LOS ANGELES

No Leakage
No Lubrication

That's why Ingersoll-Rand's advanced design
DMV and DHV PUMPS
can end your maintenance problems in general hydraulic service

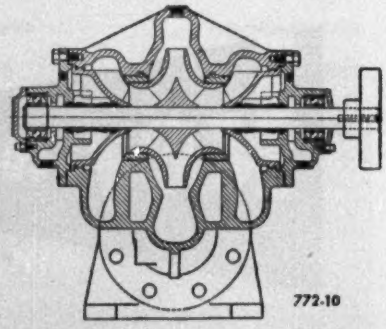
SINGLE-STAGE
DOUBLE-SUCTION
HEADS TO 340 FT.
CAPACITIES TO 2100 GPM
TEMPERATURES TO 200° F.



- **Extra Protection Against Shaft Leakage** through use of efficient *double* shaft seals in place of usual, packed stuffing boxes.
- **Double Shaft Seals** end stuffing box maintenance.
- **Longer Seal Life** assured with *double* shaft seals. Clean sealing water is injected to protect sealing surfaces when pumping gritty liquids.
- **Sealed, Cartridge-Type Bearings** require no lubrication throughout their service life.

These advanced design features make the DMV line the simplest and most maintenance-free single-stage double-suction pumps ever developed by Ingersoll-Rand for general hydraulic service. Ask your nearest I-R representative for complete information on this latest pumping development.

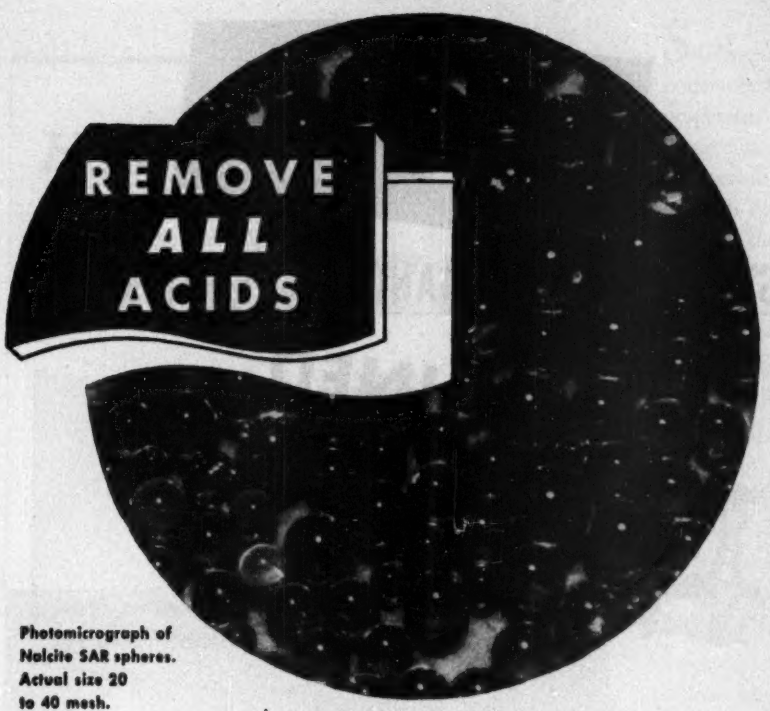
✓ Double Mechanical Shaft Seals
✓ Permanently Lubricated Ball Bearings



772-10

Ingersoll-Rand
Cameron Pump Division
11 Broadway, New York 4, N. Y.

COMPRESSORS • PUMPS • AIR AND ELECTRICAL TOOLS • VACUUM EQUIPMENT • ROCK DRILLS • CONDENSERS • GAS AND DIESEL ENGINES



Photomicrograph of Nalcite SAR spheres. Actual size 20 to 40 mesh.

WITH Nalcite SAR

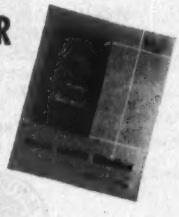
STRONGLY BASIC ANION EXCHANGE RESIN

REMOVAL of all acids, including carbonic and silicic, from water and process liquids is accomplished, without elaborate techniques or additional equipment, using Nalcite SAR strongly basic anion exchange resin.

Combining efficient anion removal and long resin life, Nalcite SAR offers new opportunities for short-cutting process techniques and assures purity of the effluent liquid.

Technical information on Nalcite SAR is contained in the bulletin described below. Bulletins on other high capacity Nalco ion exchange materials are available without obligation upon request.

TECHNICAL DATA ON Nalcite SAR



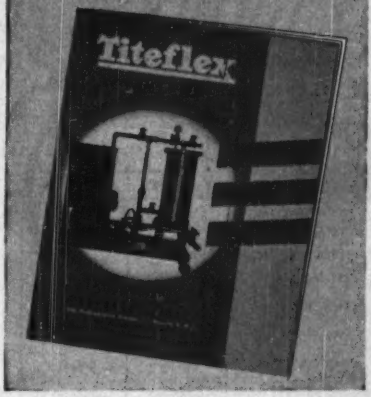
Complete data on Nalcite SAR properties, performance, and typical results. Includes charts, graphs, and sample calculations. 16 pages. Sent free upon request.

NATIONAL ALUMINATE CORPORATION
6236 West 66th Place • Chicago 38, Illinois
In Canada: Alchem Limited, Burlington, Ontario

A Nalco PRODUCT

When you use Nalcite resins, you take advantage of Nalco's long and broad experience in water and process technology.

REDUCE FILTRATION TROUBLES!



FREE BOOKLET . . . FREE ADVICE

If you need a new or another filter, but are wondering about filter costs, operation, and suitability for your purpose, you have two good friends—your Titeflex Engineer and the Titeflex Filter Booklet.

The Filter Booklet will show you how Titeflex Filters are constructed and how they work.

Your Titeflex Engineer will set you straight on costs and equipment for your special needs. He's the right man to have around if you are having filtration troubles now.

Don't let any thought of obligation to us delay mailing of the coupon below today. We are low-pressure, service-minded engineers, not high-pressure promoters.

Businesses served by Titeflex Filters include . . .

Chemical	Distilling
Electroplating	Dry Cleaning
Soap	Paints & Lacquers
Cosmetics	Water
Pharmaceuticals	Food Processing
Wine	Edible Oils
Beverages	Food Extracts
Machine Tool	

Titeflex — *Let Our Family of Products Help Yours*

MAIL COUPON TODAY

TITEFLEX, INC.
504 Frelinghuysen Ave.
Newark 5, N.J.

☐ Please send me a copy of your Free Booklet about Titeflex Filters.

☐ We need the advice of a Titeflex Filtration Engineer . . . without obligation on our part.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE___ STATE____

A NEW Lightweight Champion!

Characteristics	OLD TYPE	YOUNG A-800
SPECIFICATIONS		
WEIGHT	445 lbs.	230 lbs.
LENGTH	90 in.	49 in.
TUBE DIAM.	⅝ in.	¼ in.
COOLING CAP.	Same	Same
LIST PRICE	$485.00	$370.00

YOUNG A-800 SHELL-AND-TUBE HEAT EXCHANGER OFFERS COMPACTNESS—LOW COST

There is 20% more tube surface per unit volume of space in the new Young A-800 Heat Exchanger. This has been accomplished by better utilization of space within the shell and, as a result, offers new economy in clean water cooling of oil or hydraulic fluids.

Its fixed tube bundle is another space-saving feature. The Young-designed fabricated bonnets assure smooth inlet-outlet flow with minimum impact on headers, and are removable for ease in cleaning and inspection.

Check the complete Young Line before making your next purchase.

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Heating, Cooling, and Air Conditioning Products for Home and Industry.

T. M. REG. U. S. PAT. OFF.

YOUNG RADIATOR COMPANY

Dept. 313-B, • RACINE, WISCONSIN

Plants at Racine, Wisconsin and Mattoon, Illinois

DISCOVER FOR YOURSELF A NEW HEAT TRANSFER ECONOMY

YOUNG RADIATOR COMPANY
Dept. 313-B, RACINE, WIS.

Rush me the facts about your ☐ Fixed ☐ Removable Tube Bundle Heat Exchangers, without obligation.

Name_____

Company_____

Street_____

City_____ Zone____ State_____

Now!

STEAM and MECHANICAL ATOMIZATION COMBINED...

PATENT PENDING

NATIONAL AIROIL DUAL STAGE OIL BURNER

Now, at last, the inherent advantages of *both* systems of fuel oil atomization are *profitably* yours . . . within the one, new NATIONAL AIROIL Dual Stage Burner.

41 years of combustion equipment design and manufacture are in back of the Dual Stage Oil Burner . . . and, it has been thoroughly tested and proved in the field for firing: Petroleum Processing Heaters; Rotary Kilns; H.R.T., Scotch Marine and Water Tube Boilers; etc.

Available in three sizes, the NATIONAL AIROIL Dual Stage Burner fires all grades of fuel oil from No. 2 to No. 6, with a ready capacity of 80 to 300 g.p.h. Further, for a perfect flame pattern, we would recommend using with the Dual Stage Burner either the NATIONAL AIROIL Universal Register for forced draft or, the NATIONAL AIROIL Tandem Unit for natural or induced draft furnaces.

Get detailed description, illustration, and specifications in NATIONAL AIROIL Bulletin 25.

STEAM ATOMIZING OIL BURNERS
OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL HEATERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
AIR INTAKE DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

NATIONAL AIROIL BURNER CO., INC.

1235 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.

Southwestern Division: 2512 South Boulevard, Houston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

Here's a refractory that

CONDUCTS HEAT

...as rapidly as chrome-nickel steels

In addition to various bricks and cements, Super Refractories are also available in a wide variety of special shapes, molded to close tolerances, including fitted joints, tubes, etc.

Silicon carbide refractories by CARBORUNDUM—sold under the trade mark, CARBOFRAX — possess many properties not usually associated with refractories. In certain respects, they are actually more akin to heat resisting metals. They are very strong (crushing strength of over 10,000 psi at 2460 F); very hard (one of the most abrasion-resistant materials available commercially); and highly durable (often outlasting alloy parts, 5 or 10 to 1). Plus the fact, that they can be used at temperatures up to and exceeding 3000 F . . . roughly 1000 degrees over the upper limits for metals.

But, most important, at elevated temperatures they *conduct heat* approximately as fast as chrome-nickel steels — or, 11 to 12 times faster than standard fireclay refractories! Thus, they are ideal for radiant tubes, muffles, hearths, and other furnace zones where indirect heating is used.

Their ability to transfer heat speedily also fits them perfectly for heat-exchange equipment, such as checkers and recuperator tubes. CARBOFRAX checkers, for example, absorb 2 to 5 times as many BTU's per second as fireclay checkers! And conversely, these refractories play an equally important role where heat must be *dissipated* (e.g. arc shields, pot linings, etc.)

These distinctive properties classify CARBOFRAX refractories as uniquely different materials. They do a great variety of jobs more efficiently — and at lower cost.

Of course, they are no universal cure-all. There are times when they should be applied with caution. Under such conditions, possibly some other Super Refractories selected from the wide variety produced by CARBORUNDUM may prove better fitted.

For a brief description of these unusual materials, with examples of applications, send for our 20 page booklet. No charge, of course.

Dept. H-23 Refractories Division
The Carborundum Company, Perth Amboy, N. J.

Send complimentary copy of Super Refractories booklet to:

NAME_____

POSITION_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

Super Refractories by
CARBORUNDUM
Trade Mark

"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company

DOW

DOW OFFERS NEW PHENOL BOOKLET

presenting valuable information on properties, uses and handling... write for your copy.

The Dow Chemical Company
Dept. OC 39—Midland, Michigan

Please send me the new Dow Phenol Booklet.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

TO FILL your need for authoritative, up-to-date information on phenol, Dow has prepared the book "Phenol—Properties, Uses and Handling." It is based on Dow's many years' experience as a major producer and user of phenol.

Whether your prime endeavor is in research, production or management, you will find useful data here to help you better utilize this important industrial chemical in your product or process. Write today for your free copy. THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS

DOW

FOR DEPENDABLE PERFORMANCE

Specify WOLVERINE QUALITY-CONTROLLED CONDENSER TUBES

● Wolverine condenser tube is manufactured in standard diameters, wall thicknesses and lengths—and in a number of alloys. It is packaged carefully to give utmost protection during shipment and storage and for your convenience in handling at time of use—

PLAIN TUBE

In sizes from ⅝" to 2" O.D.

Wall thicknesses from .042" to .180".

Lengths up to 50 ft.

Alloys: copper, cupro-nickel, aluminum, brass, red brass, 70-30 brass, Muntz metal.

Tempers: All condenser tubing furnished in accordance with ASTM B-111 Specification or similar specifications.

FINNED TUBE

WOLVERINE TRUFIN* —THE INTEGRAL FINNED TUBE

Furnished with plain ends to permit best assembly.

In nominal sizes from ⅜" to ¾"—root diameter.

Wall thicknesses from .032" to .065".

Alloys: copper, cupro-nickel, red brass, admiralty, aluminum, aluminum-brass, SAE 1010 steel, and stainless steel.

End treatments: *plain ends*, stripped, full-finned, or variations of these end treatments.

WOLVERINE TUBE DIVISION

of Calumet & Hecla, Inc.

Manufacturers of tubing exclusively

1427 Central Ave. • Detroit 9, Michigan

*REG. U.S. PAT. OFF.

Wolverine Trufin and the Wolverine Spun End Process available in Canada thru the Unifin Tube Co., London, Ontario

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA

Sales Offices in Principal Cities

Export Department, 13 E. 40th St., New York City 16, N. Y.

Jefferson... for highest-quality

ETHYLENE DICHLORIDE

Available immediately in tank cars and 55-gallon drums, or in samples for your preliminary investigations. (Address inquiries to Department G.)

Produced by specialists in essential chemicals from hydrocarbon sources.

Essential Chemicals From Hydrocarbon Sources:
Ethylene Oxide
Ethylene Glycol
Ethylene Dichloride
Diethylene Glycol
Monoethanolamine
Diethanolamine
Triethanolamine
Nonyl Phenol
Morpholine
Ethylene Carbonate
Propylene Carbonate

Jefferson CHEMICAL COMPANY, INC.
260 MADISON AVENUE, NEW YORK 16, N. Y.

Houston Sales Office: 318 Melrose Building, Houston 2, Texas
Warehouse Stocks: Tenafly, New Jersey; Chicago, Illinois; Houston, Texas

Briefs

From recent literature

No. 4 in a Series

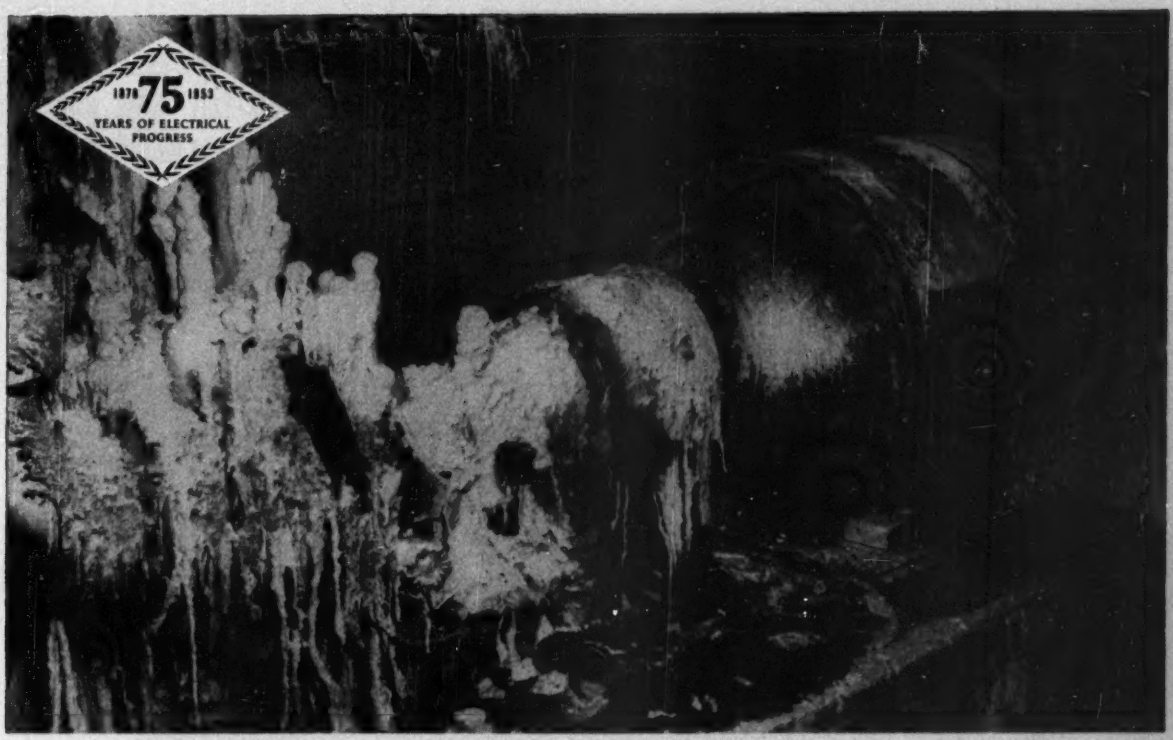
Desludging fluid for internal combustion engines, Diesel engines and the like, can be formulated using ethylene dichloride, soap, alcohol, cresol and naphtha. This formula when substituted for lubricating oil will not only effectively desludge the crankcase and associated parts but will have a lubricating effect on the operating units.

Anabasine, a liquid alkaloid that closely resembles nicotine in physical, chemical, toxological and insecticidal properties, can be extracted from all parts of the tree tobacco plant with ethylene dichloride.

Benzoyl peroxide may be reacted with ethylene dichloride to give phenol and benzene. Coproducts of the reaction are p-$PhC_6H_4CO_2H$, diphenyl, trichlorobutene, and 1, 2, 3, 4-tetrachlorobutane.

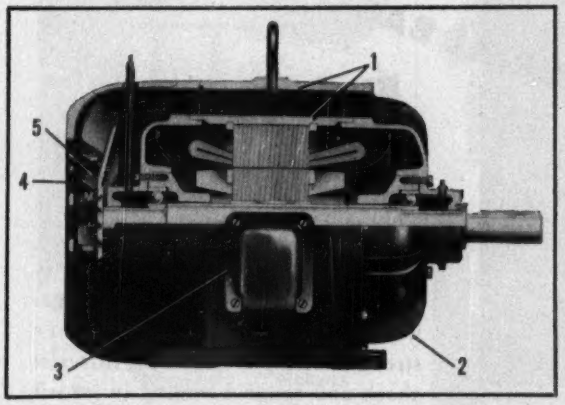
N-vinyl compounds such as N-vinyl pyrrole or N-vinyl carbazole monomers, can be polymerized in ethylene dichloride solution to form materials which have high softening points. The reaction, using BF_3 as a catalyst, is started at room temperature with the ratio of solvent to monomer of 4 or 6:1. When such a ratio is employed, the reaction is more readily controlled because the temperature will remain nearly constant at about the boiling point of the ethylene dichloride.

These developments are abstracted from recent publications or U. S. patents. They may suggest applications of Jefferson Ethylene Dichloride in your products or processes.



TOUGH CHEMICAL-PLANT JOBS in corrosive atmospheres prove the superiority of standard "off-the-shelf" Tri-Clad motors. This totally enclosed fan-cooled Tri-Clad motor runs 12 hours a day, 6 days a week, driving a flash cooler pump.

Cast-iron construction protects this true chemical motor against corrosion



CORROSION PROTECTION is assured by, 1) Cast-iron frames, 2) Reinforced cast-iron end shield, 3) Cast-iron sealed conduit box, 4) Cast-iron fan grill, 5) Non-sparking, non-corrosive fan.

G-E standard Tri-Clad* TEFC motor needs no special paints or other "extras"

Designed as a chemical motor, sold as a standard motor, the G-E Tri-Clad totally enclosed fan-cooled motor of cast-iron construction is still superior to "specials."

Heavy-duty cast-iron is corrosion resistant, needs no additional paints, or other "extras." Nor is it subject to corrosive attacks from nicks in the coatings.

Long-lasting cast-iron is not subject to pitting which causes structural weakness. External hardware and fittings are also corrosion resistant.

For more data, ask your G-E Apparatus Sales representative or write for Bulletin GEA-4400 to General Electric Co., Section 662-41, Schenectady 5, N. Y.

*Registered trade-mark of General Electric Company.

You can put your confidence in—

GENERAL ELECTRIC

cuts costly bag breakage in the packaging of these products:

sharkraft

L BAG

BUILT TO TAKE IT!

The CHASE SHARKRAFT bag is designed to cut costly bag breakage. Every ply is crinkled for greater strength and pliability and to resist shock and rough handling in transit and storage. The textured surface makes SHARKRAFT bags easy to handle; and allows higher stacking with absolute safety. Printing is clear and sharp—makes your trademark or brand name stand out. For a sample bag and additional details to meet your specific requirements, call or write today.

SINCE 1847

CHASE BAG COMPANY

GENERAL SALES OFFICES: 309 W. JACKSON BLVD., CHICAGO 6, ILL.
30 BRANCHES AND SALES OFFICES STRATEGICALLY LOCATED

Save Time, Labor, Dollars!

TEST • STUDY • CONTROL

VISCOSITY

As Simply, Quickly and Easily as Taking Temperature Readings

Just a flick of a switch, then read the Brookfield dial, and you have your viscosity determination in centipoises. The whole operation, including cleaning up, *takes only a minute or two.*

Available in a variety of models suitable for extremely accurate work with both Newtonian and non-Newtonian materials, Brookfield Viscometers are portable and plug in any A. C. outlet — *can be used in Lab, Plant or both.*

Write today for fully illustrated catalog showing Brookfield Viscometers adaptable to any viscosity problem *from less than one to 32,000,000 centipoises.*

BROOKFIELD COUNTER-ROTATING MIXER — Two concentric, oppositely rotating shafts, propeller equipped and driven by two motors, produce an annular flow and up to 48,000 scissor-like cuts/minute. Enable exceptionally fast, effective and efficient laboratory mixing. *Not* a "stirrer." Write for Brookfield MIXER brochure.

Brookfield ENGINEERING LABORATORIES, INC.
235 Fortw St., Stoughton, Mass.

Remote Recorder prints exact weight on tape or tickets

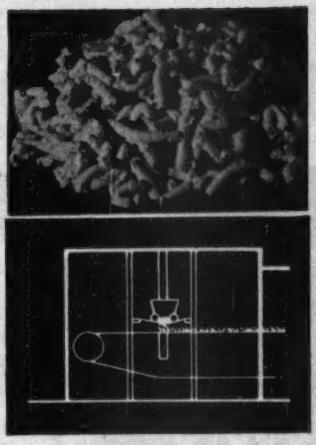
Write for free Ametron brochure M-2

REDUCE INSTALLATION COSTS! Entire assembly ready to attach to crane or hoist. Only a cable connection is run from Baldwin Load Cell to REMOTE RECORDER.

REDUCE OPERATING COSTS! Great savings in time and man power possible because weighing and transporting operations are combined. Easily removed from crane.

REDUCE MAINTENANCE COSTS! load cell can be easily replaced or interchanged.

STREETER-AMET COMPANY
8101 RAVENSWOOD AVENUE • CHICAGO 13, ILLINOIS



PROBLEM:
To increase the production of sulfa drugs to meet the market demands — yet control the quality of finished product.

SOLUTION:
A Proctor continuous conveyor system with a rolling extruder equipped with a special grid type plate was recommended by Proctor engineers. Preforming permits air to circulate through the bed of material on the constantly moving conveyor. Accurate control was maintained, production was increased and the product met all the tests for quality.

Another processing problem solved by

PROCTOR

INTEGRATED ENGINEERING

This processing problem was solved only by painstaking research. Exhaustive test work done in the Proctor laboratory, in cooperation with the customer's technicians, netted conclusive results that were projected into full scale operation. So accurate was this work that the performance of the drying system was guaranteed in the sales contract and the dryer was designed to dovetail right into the complete processing line. This approach to a processing problem is INTEGRATED ENGINEERING AT WORK!

By INTEGRATED ENGINEERING we mean simply this —

1. Sales engineers are available for consultation.
2. A completely equipped experimental laboratory is available for test work at no cost or obligation.
3. Engineering background and experience in drying equipment and its relation to associated processing equipment in the range.
4. Close cooperation between Proctor engineers and the customer's technicians to bring about the solution to processing problems.

NOW PROCTOR IS PREPARED TO ENGINEER AND MANUFACTURE RELATED EQUIPMENT

With their long background in designing and building precision drying machinery, Proctor engineers have acquired a wide knowledge of processing equipment requirements . . . so that today Proctor & Schwartz actually offers a complete engineering-manufacturing facility ready to help you consider not only your drying equipment needs—but a complete range of related processing equipment.

What is your processing machinery problem? Let Proctor INTEGRATED ENGINEERING help speed your solution.

PROCTOR & SCHWARTZ ·INC·
711 TABOR ROAD
Philadelphia 20, Pa.

Here's how MANY INDUSTRIES make BETTER PRODUCTS at LOWER COST with

BUFLOVAK Evaporators serve every industry where liquids must be concentrated.

Concentrating crystal-forming liquids is but one of the many applications.

1. Continuous, low-cost evaporation is the primary process in the profitable operation of many chemical processes.

2. The production of a clear concentrate is highly important when evaporating crystal-bearing liquids or the crystal-forming liquids. BUFLOVAK Patented Crystal Classifiers simplify and improve general operating results.

3. Continuous removal of crystals. The large crystals go to the salt filter. The small crystals are returned to the evaporator where they grow to the desired size and are returned with the mother liquor to the classifier.

These units can be built separately, or as an integral part of the evaporator, for batch or continuous operation.

BUFLOVAK BUILDS

EVAPORATORS
Low-Temperature
By-Product Recovery
Chemicals
Food Product
Crystallization

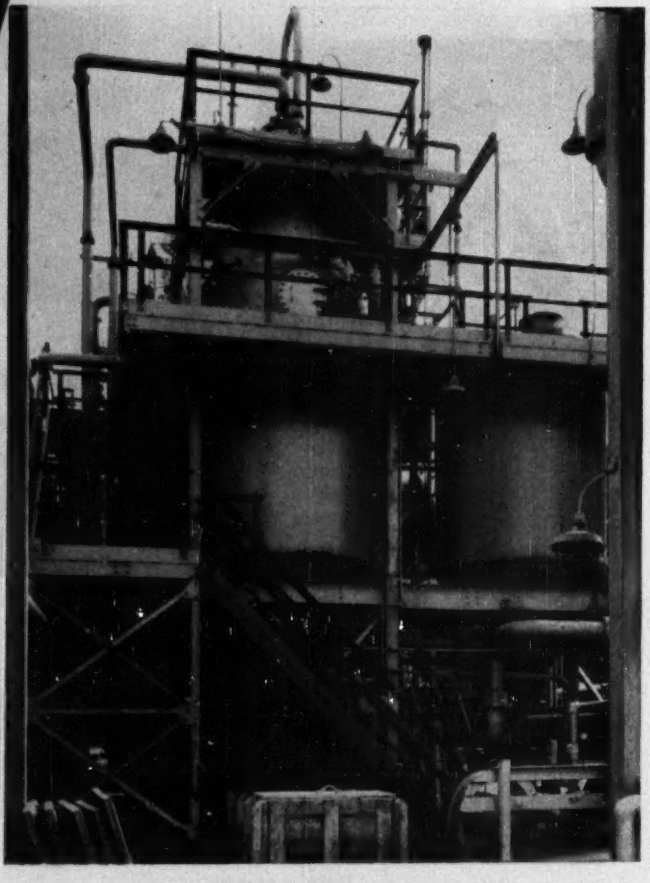
DRYERS
Vacuum Double Drum
Vacuum Rotary
Pilot Plant
Atmospheric

PROCESSING KETTLES
Mixers
Impregnators
Dopp Kettles
Solvent Recovery & Distillation Equipment

SEND FOR CATALOGS

RESEARCH AND TESTING LABORATORY

To assist you in the solution of processing problems, BUFLOVAK offers the facilities of its Research and Testing Laboratory . . . where small scale experimental units show you, before you buy, the commercial possibilities, data on production cost, and characteristics of the finished product.



This BUFLOVAK Crystal Classifier, used in connection with a large Triple Effect Evaporator, plays an important part in the process of synthesizing glycerine from petroleum.

Buflovak Equipment

DIVISION OF BLAW-KNOX CO.
1551 FILLMORE AVENUE
BUFFALO 11, N.Y.

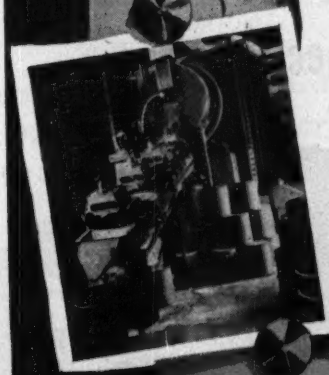
This complete 72 page booklet on BUFLOVAK Evaporators has proved helpful to many. A request on your company letterhead will bring a copy free.

• Davison Bulletin •

Check for application

AVAILABLE FOR THE FIRST TIME

Organic Silicofluorides



Davison's Research and Development Department has devised a method of commercially producing a series of silicofluorides which have previously been known only as laboratory curiosities. Now available:

Methylamine Silicofluoride ($C_1H_{11}N_2SiF_6$)
Dibutylamine Silicofluoride ($C_{16}H_{41}N_2SiF_6$)
Ethylhexylamine Silicofluoride ($C_{32}H_{72}N_2SiF_6$)
Aniline Silicofluoride ($C_{12}H_{12}N_2SiF_6$)
Rosin Amine Silicofluoride ($C_{48}H_{66}N_2SiF_6$)
Morpholine Silicofluoride ($C_8H_{19}N_2O_2SiF_6$)

Preliminary use research has led Davison's technical representatives to believe that there are many varied applications for these products.

The properties of the materials vary widely. The molecular weight is from 206 to 719; fluorine content 18.2% to 55.17% and pH in 5% water solution, 2.8 to 4.2.

For full chemical and physical properties write for Product Data Sheet on Davison's Organic Silicofluorides, today.

Anti-Blocking Agent

Davison now has available a series of high quality, uniform fine sized silicas. The amorphous form of silica possesses unique characteristics when compared to crystalline silicas, e.g. sand. Silica gel, a highly porous form of amorphous silica, characteristically has a large pore volume and surface area. For example, when divided into fine particles less than 20 microns, the porous high surface area characteristics continue to exist, making the product specific for a wide variety of special applications. The product is white in appearance and completely uniform in chemical and physical characteristics.

Commercial forms of silica gel available differ primarily in pore size, surface area, and apparent bulk density. These differences, in addition to the variations produced by surface treatments and particle sizing, have resulted in a series of finely divided silicas adaptable to diversified uses. Many of these grades are now available for anti-blocking and flatting plastic sheeting.

Mail coupon for complete information, chemical and physical characteristics, and suggested applications, or contact your Davison Field Service Engineer.

FREE Literature Available On Method Of Determining Fluid Catalyst Particle Size

An analytical method for ascertaining the size distribution of either a fresh or used catalyst developed specifically to serve requirements of the industry. For your free copy, use the coupon.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION
Baltimore 3, Maryland

Producers of:
Catalysts, Inorganic Acids, Superphosphates, Phosphate Rock, Silica Gels, and Silicofluorides. Sole Producers of Davco Granulated Fertilizers.

Please send me Product Data Sheets on

- ☐ Organic Silicofluorides
- ☐ Fine Sized Silicas
- ☐ Method of Determining Fluid Catalyst Particle Size

Name.....Title.....

Company.....

Street.....

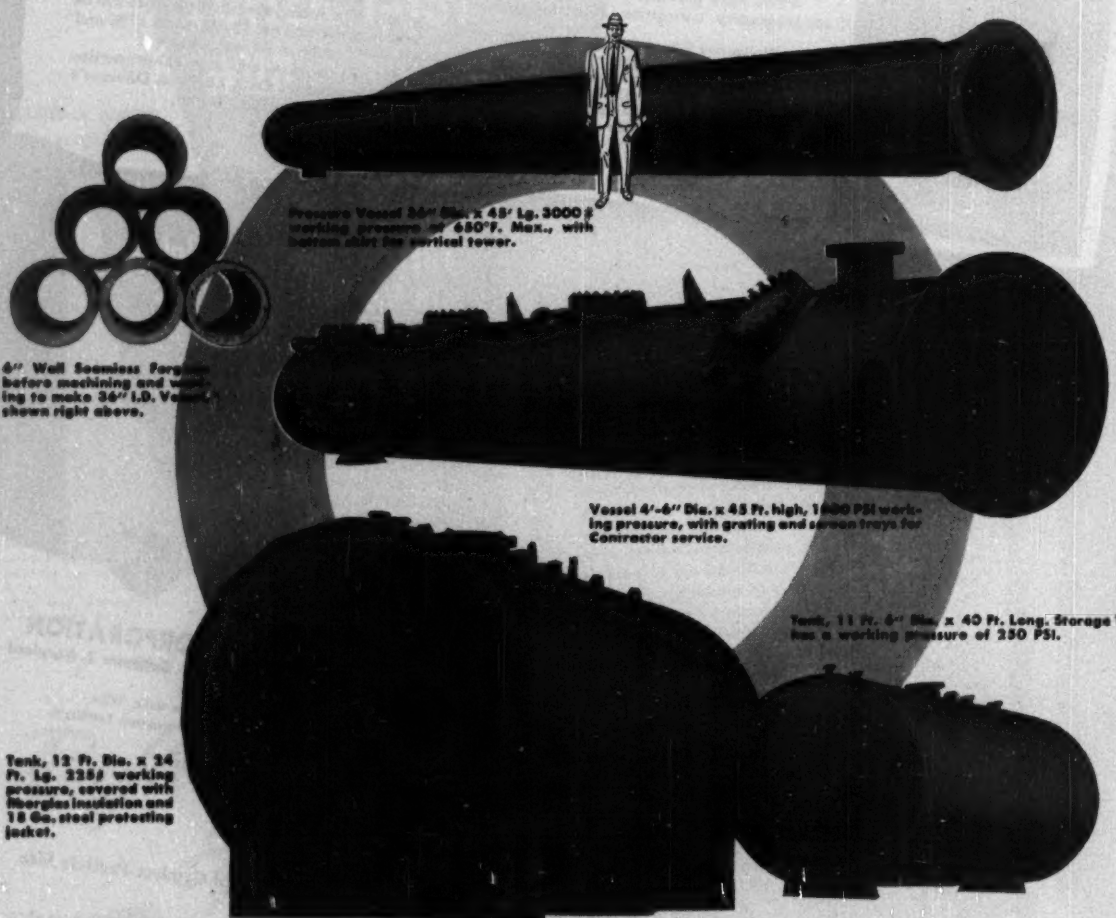
City.....Zone....State.....

Look to . . .

STRUTHERS WELLS for PROCESSING EQUIPMENT

Struthers Wells, backed by 100 years of experience in the design and fabrication of all types of processing equipment . . . has the plants, engineers and craftsmen, and the facilities to successfully handle your most difficult job. Facilities include a complete forge plant, large welding shops, welding machines, large machine and pattern shops, newest X-Ray equipment, latest annealing furnaces for stress relieving, and water spray quenching equipment. Yes . . . you can look to Struthers Wells for dependable processing equipment—fabricated of almost any metal or alloy.

That Meets all ASME or API Codes —and Your Most Exacting Specifications



Pressure Vessel 36" Dia. x 45' Lg. 3000# working pressure at 650°F. Max., with bottom skirt for vertical tower.

6" Wall Seamless Forging before machining and welding to make 36" I.D. Vessel shown right above.

Vessel 4'-6" Dia. x 45 Ft. high, 1600 PSI working pressure, with grating and screen trays for Contractor service.

Tank, 11 Ft. 6" Dia. x 40 Ft. Long. Storage Tank has a working pressure of 250 PSI.

Tank, 12 Ft. Dia. x 24 Ft. Lg. 225# working pressure, covered with fiberglas insulation and 18 Ga. steel protecting jacket.

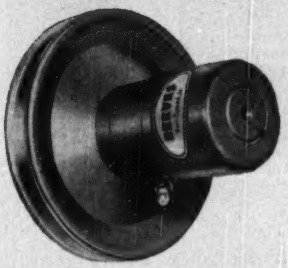
Struthers Wells

STRUTHERS WELLS CORPORATION

Process Equipment Division • **TITUSVILLE, PA.**

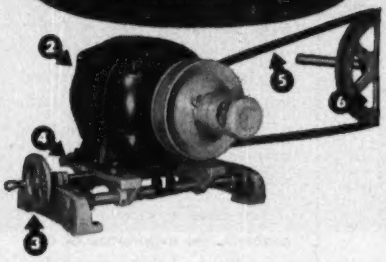
Plants at Titusville, Pa. • Warren, Pa. • *Offices in Principal Cities*

LOW-COST
VARIABLE SPEED
for light machinery



converts any standard constant-speed motor to a variable speed drive

REEVES
Vari-Speed Jr.



1. REEVES Vari-Speed Jr. is placed on motor shaft.
2. Any standard, constant-speed motor, ⅛ to 1½ hp.
3. Handwheel moves motor forward or backward for speed variation.
4. Sliding motor base.
5. Any standard V-belt.
6. Any standard sheave.

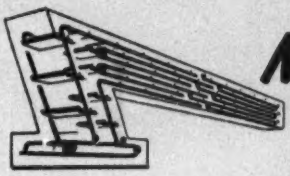
Widen the work range of your light machines by installing REEVES Vari-Speed Jr. Easily applied . . . provides stepless speed adjustability in ratios up to 2¼ to 1. No intricate mechanisms . . . no chain drives, gears, multiple belts, etc. Write for complete information to Dept. CE9.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA
Recognized leader in variable speed control

REEVES
Variable Speed Drives

INVESTIGATE!

GREER



MULTI-TIER METHODS

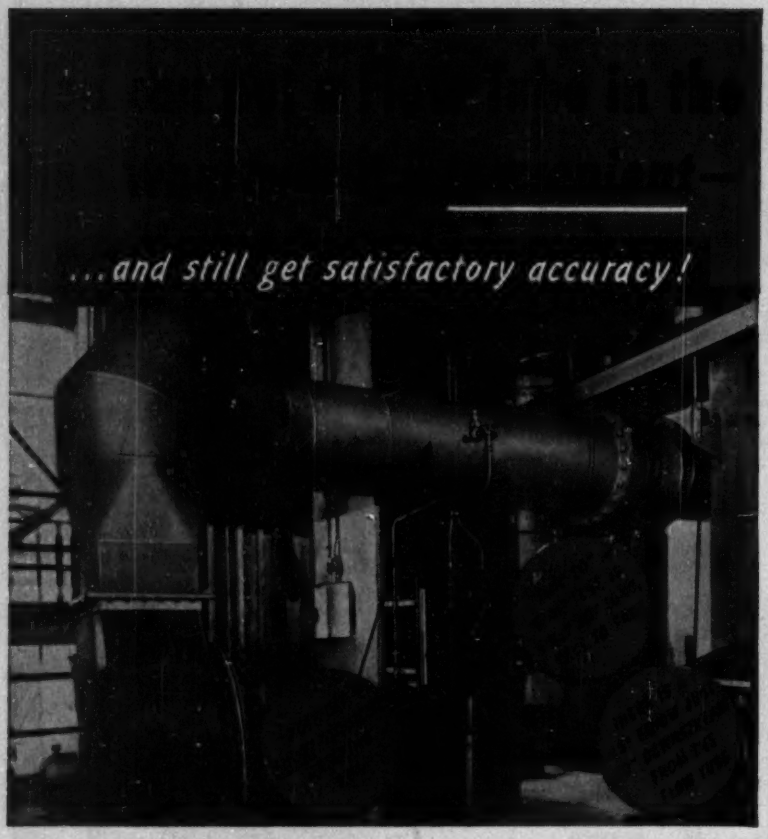
For over thirty years GREER ENGINEERING has applied the principle of the Multi-Tier Conveyor to many industries whose methods required some form of heating, drying or cooling processes.

RESULTS!
- Streamlined Production
- Valuable Space Savings
- Batch Methods Eliminated
- Labor Costs Cut
- Greater Production at Lower Costs

Competent engineers are prepared to work with you on plant layout and design. *If you have a material handling problem with space limitations, write us for further information. No obligation.*

J. W. GREER COMPANY
Cambridge 39, Massachusetts

SALES ENGINEERING OFFICES
New York, N. Y. Chicago, Ill.
San Francisco, California



The Flow Tube needs only minimum straight runs entering and following the tube, and the Flow Tube itself takes up so little space that it can be installed at practically any accessible point where flow conditions are reasonably steady. This means considerable savings in space and equipment to provide straight entering runs required by conventional head meters.

The installation shown above in a catalytic cracking unit of a Southwestern oil refinery is a typical example. Here a 30" Flow Tube with a 23.9" throat (D/d=1.26) is measuring the air used to reactivate the catalyst. It delivers a differential of 10" of water for a maximum flow of 39,000 standard cfm at 137°F. and 3.5 psig. The unrecovered head loss in this Tube at maximum flow is 1" of water. Two other tubes are also operating under similar conditions in this refinery.

All are performing satisfactorily as installed. Periodic checks all show that they are measuring within plus or minus 2% of the blower manufacturer's characteristic curve.

Flow Tubes are manufactured exclusively by Foster Engineering Co. in all pipe sizes for measuring the flow of liquids and wet or dry gases. Flow Tubes can be furnished with or without suitable secondary indicating, recording, or totalizing instruments. For further information, ask for Bulletin FT-101; and for specific recommendations, please send us necessary flow data.

FOSTER ENGINEERING

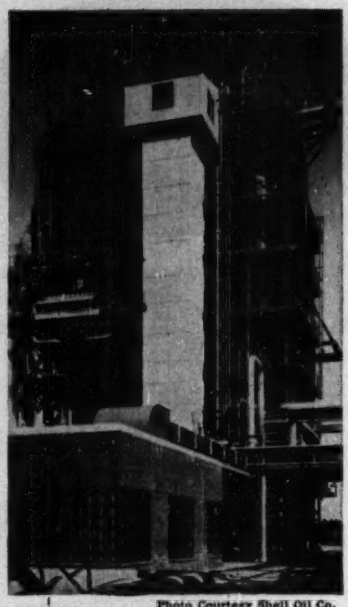


Photo Courtesy Shell Oil Co.

STAINLESS STEEL TUBING SPECIALISTS

For expansion, replacement or new construction, look to Murray for your pipe and tubing requirements. Welded or seamless stainless pipe or tubing and a wide variety of fittings are available from warehouse stocks.

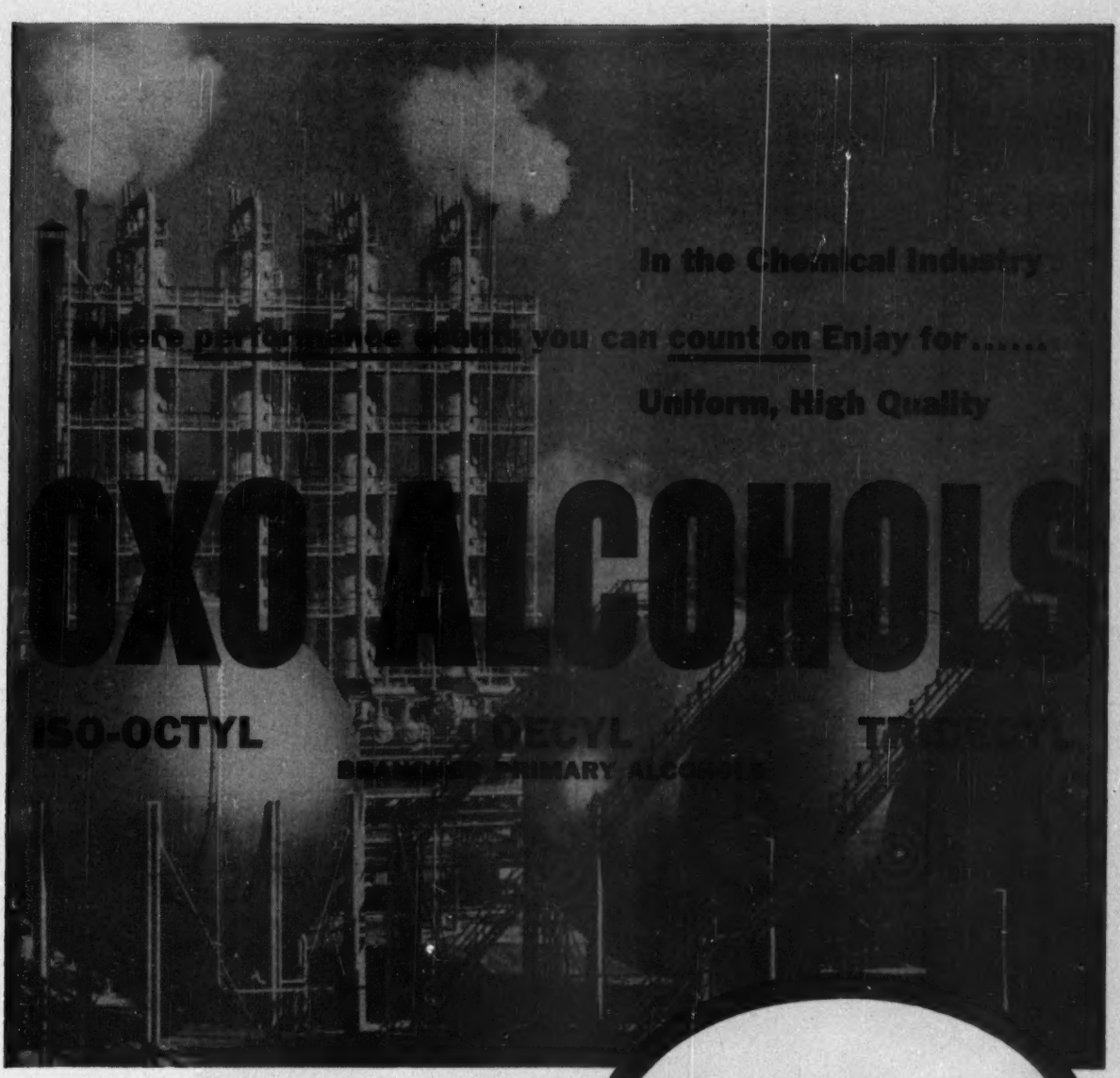
If you have a pipe or tubing problem, the experience of our specialists and the research facilities of our suppliers are at your service.

Other Murray products include carbon steel tubing and pipe for mechanical and pressure purposes; welding and screw type pipe and tube fittings. Tube bending, swaging, upsetting.

WRITE FOR CURRENT TUBE STOCK BULLETIN

7244

A B MURRAY CO INC
ESTABLISHED 1845
ELIZABETH, N. J. McKEESPORT, PA.



A pioneer and leading marketer of Oxo-Alcohols, the Enjay Company with its affiliates, have greatly expanded production to keep pace with increased sales. Quality has been constantly improved. More and more manufacturers of esters, plasticizers, synthetic oils, detergents and other chemical derivatives are turning to Enjay for Oxo-Alcohols.

ENJAY

A complete line of dependable products for industry

PETROLEUM

Paranox
Paratone
Paraflow
Parapoid
Paradyne
Paratac
Enjay Anti-Freeze
Petrohol
Methyl Ethyl Ketone
Dewaxing Aid
Ethyl Ether
Isopropyl Ether
Reference Fuels

SURFACE COATING

Petrohol 91
Petrohol 95
Petrohol 99
Secondary Butyl Alcohol
Secondary Butyl Acetate
Isopropyl Acetate
Acetone
Methyl Ethyl Ketone
Ethyl Ether
Isopropyl Ether
Dicyclopentadiene
Naphthenic Acids
Iso-Octyl Alcohol
Decyl Alcohol

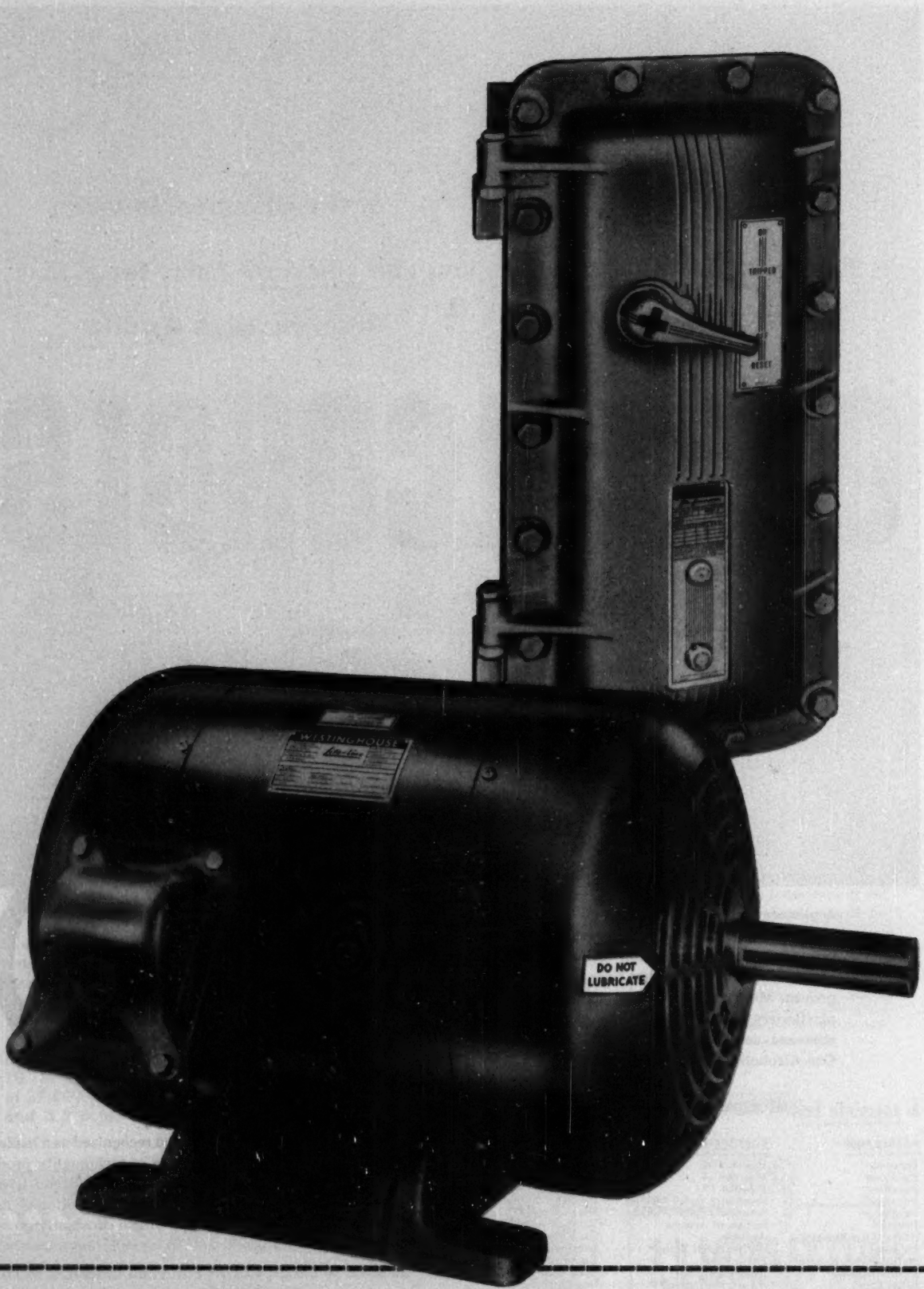
CHEMICAL

Petrohol 91
Petrohol 95
Petrohol 99
Iso-Octyl Alcohol
Decyl Alcohol
Trideeyl Alcohol
Dicyclopentadiene
Isoprene
Butadiene
Ethyl Ether
Isopropyl Ether
Tripropylene
Tetrapropylene
Aromatic Tars
Acetone
Methyl Ethyl Ketone

The Enjay Company has long been recognized as a leader in the development and marketing of high-quality products for the oil, surface coating and chemical industries. Backed by greatly expanded plant and distribution facilities, the Enjay Company is supplying a constantly growing list of chemical products to many different industries.

BE SURE TO CALL ON ENJAY FOR YOUR CHEMICAL NEEDS

ENJAY COMPANY, INC.
15 West 51st Street, New York 19, N.Y.



WHAT *Life-Line* REALLY DELIVERS IS MORE SERVICE... LESS SERVICING

The time to stop explosions is before they start

And here's the equipment to do it

Dual Label Explosion-Proof Motor

In any location where Class II, Group G, or Class I, Group D explosive materials present a hazard, you can operate this Life-Line explosion-proof motor safely. It's underwriter approved for *both* explosive dusts and explosive vapors.

And the Life-Line offers extra protection against outages. Heavy steel construction provides greatest protection against physical damage. Pre-lubricated bearings need no further lubrication . . . eliminate outages due to faulty greasing. Superior winding techniques and insulation reduce electrical failures. Together they add up to longer life . . . less servicing.

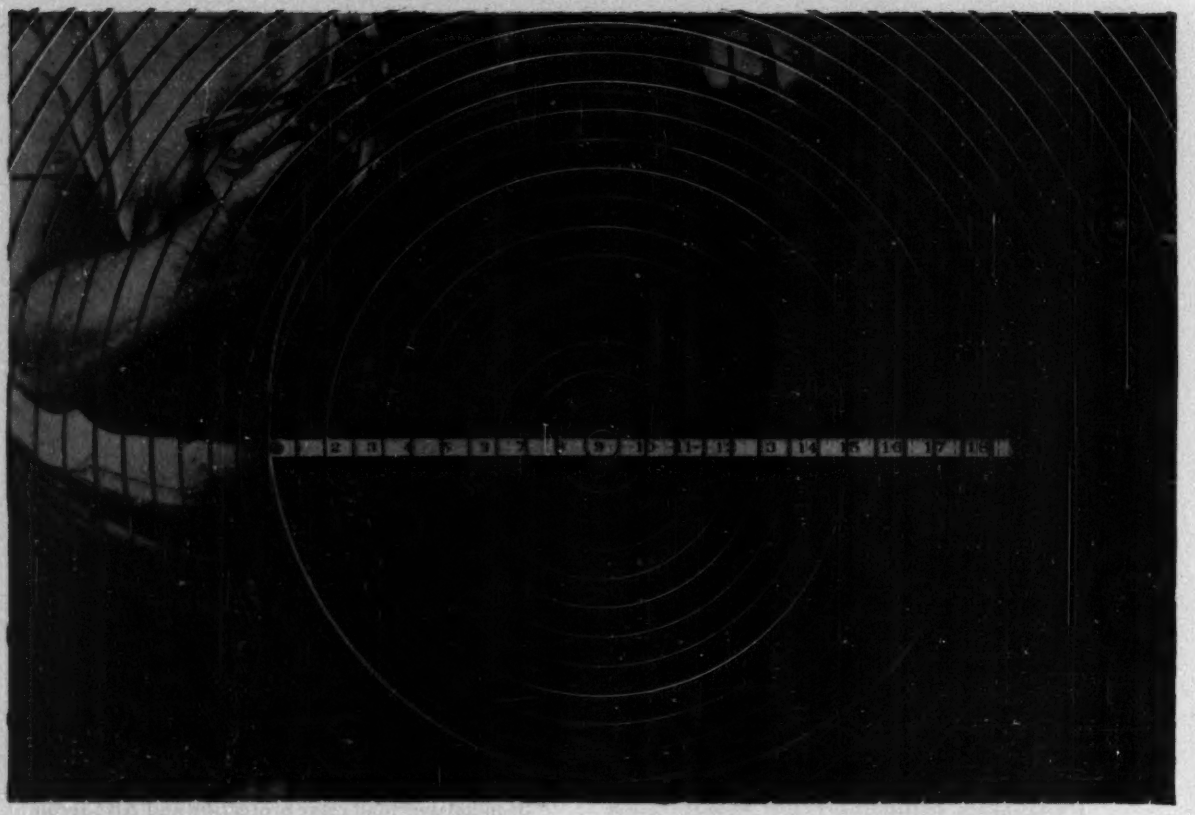
For Hazardous Locations—Life-Linestarters®

Specially reinforced, cast enclosures with wide flame seals are available in Class I, Group D. Class II, Groups E, F, G are also available. Bi-metal overload relay protection and AB Circuit Breakers cut down time. In case of fault, no need to remove cover to reset breaker or overload relay mechanism. Service is restored immediately.

Simple design, single operation mean fewer operating parts to foul. Seesaw action of clapper prevents accidental operation. Kickout spring assures positive opening. Exclusive "De-ion®" arc quenching plus silver-to-silver contacts eliminates contact filing. Compare any other starter and see why Life-Lines offer more service with less servicing.

Together Life-Line motors and starters offer the food industry a new concept in performance. You get more service on the job . . . less down time and servicing. Ask your Westinghouse representative for complete details on both, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21701-A

YOU CAN BE SURE...IF IT'S Westinghouse



from 1/8" to 40" OD

WHEN YOU NEED STAINLESS STEEL TUBING

TRENTWELD *will meet your needs best*

Name an industrial application that calls for stainless steel tubing — and the tubing to name is TRENTWELD. Available in diameters from 1/8" to 40" OD TRENTWELD presents a broad range of grades, gauges and finishes.

Study the product and the plant where it is produced and you find the reason for the steady increase in TRENTWELD usage. For TRENTWELD is made in a *tube* mill by *tube* experts who roll and weld stainless and high alloy tubing without added rod metal. This Trent method results in metallurgically correct tubing with a uniform section and uniform corrosion resistance.

No matter how specialized your tubing needs may be, you will find there's a TRENTWELD tubing to meet your most exacting requirements. To call in Trent is to put our experience at your disposal. Write us full details of your most pressing problem involving stainless or high alloy tubing.

TRENTWELD

STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

AT YOUR END OF THE
COAL CHEMICAL PIPELINE . . .

NEW
Magic Bullets
for
Murdering Microbes

Coal chemicals are the steadfast allies of the medical scientist in his uphill conquest of disease. Pyridine, for example, is vital in the manufacture of sulfa drugs. And gamma-picoline, another valuable Pittsburgh coal chemical, is the source of isonicotinic acid hydrazide, the drug which has shown bright promise in the experimental treatment of tuberculosis in recent months.

Because we control every step in the production of these coal chemicals—from coal to finished chemicals—we're able to provide the medical and pharmaceutical fields with products of exceptional high quality and purity. This same *assurance of quality* extends through the closely integrated production of our entire Neville Island plant.

Whether you need coal chemicals, agricultural chemicals, dyestuffs, or the products of any of our other divisions, you'll find Pittsburgh Coke & Chemical a reliable source . . . because we're *basic*.

WSD 4463

Alkyl methyl pyridinium chloride
Benzene meta, para-Cresol ortho-Cresol
Naphthalene Phenol Phthalic Anhydride
alpha-Picoline beta, gamma-Picoline
Isonicotinic Acid
Pyridine Sodium Cyanide
Toluene Xylene Xylenol

PITTSBURGH
COKE & CHEMICAL CO.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Glycerine provides the Emollient Action

Ever since its introduction in 1937, Dorothy Gray's "Blustery Weather Lotion" has been a great favorite with women who want to keep their skin lovely. U. S. P. Glycerine is one of the ingredients providing the emollient action; it also acts as a moisture-retainer in this popular protective lotion for chapped hands, scratchy legs, and dry skin.

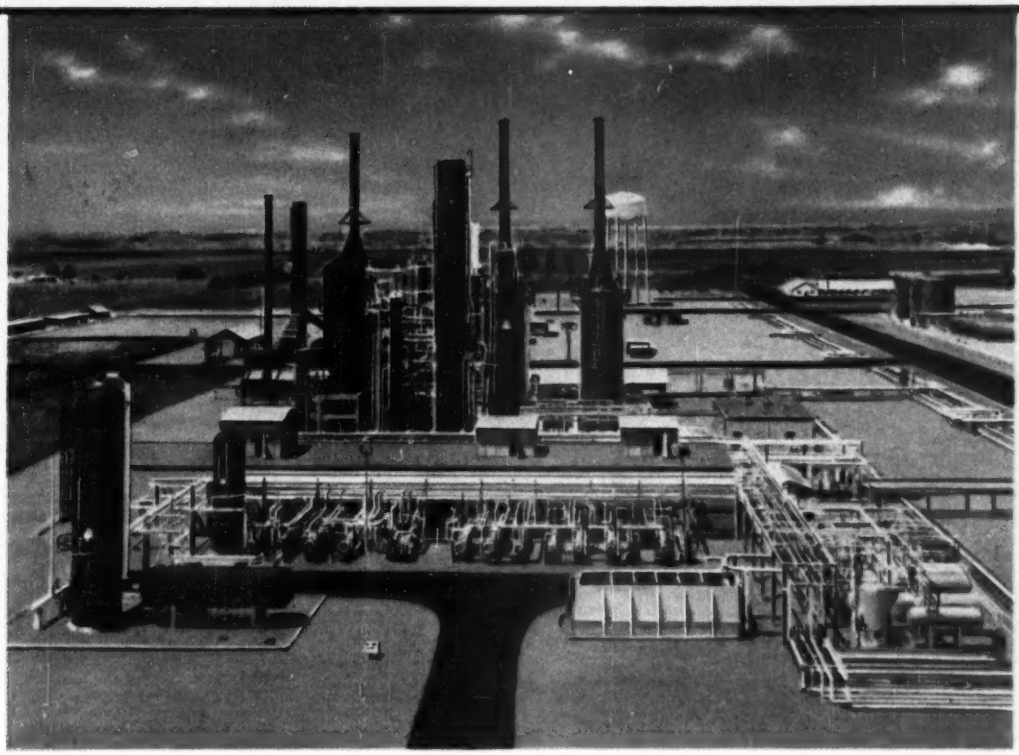
In skin lotions, beauty creams, and many other cosmetic preparations, the essential action is one of soothing and smoothing the skin. Dorothy Gray and many other leading manufacturers of cosmetics and toiletries choose Glycerine because it not only provides this important emollient action but can perform as a humectant as well.

Even more important, U. S. P. Glycerine permits the formulation of products which are physiologically safe. Glycerine has many other properties which emphasize its value in other toilet articles. It acts as a plasticizer, vehicle, bodying agent, solvent, penetrant, or anti-freeze. That's why no substitute has been found which brings all of Glycerine's qualities to the production of toilet goods.

A handy, 16-page booklet, "Why Glycerine for Drugs and Cosmetics?" reviews Glycerine's unique range of properties and applications. For your copy write Glycerine Producers' Association, 295 Madison Avenue, New York 17, N. Y.

Nothing takes the place of Glycerine

NEW HORIZONS



The Crude Distillation and Vis-breaking Unit of Sarnia Refinery, designed by Badger Process Division, processes 20,000 barrels per day of Alberta crude oil

Sarnia Refinery of Canadian Oil Refineries, Limited, is the first large, integrated refinery in Canada built for processing Canadian crude oil. It brings to this rapidly growing region the last word in technological progress in the field of petroleum refining. Such progress means better quality of product and greater efficiency in operation. Design and construction of the refinery were managed by Stone & Webster Canada Limited, utilizing the facilities of Stone & Webster Engineering Corporation.

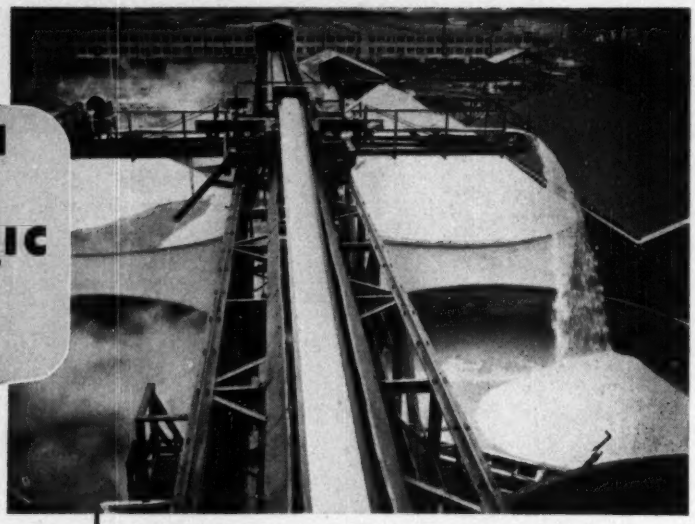
STONE & WEBSTER ENGINEERING CORPORATION

Affiliated with

STONE & WEBSTER CANADA LIMITED

E. B. BADGER & SONS (Great Britain) LTD.

Umpty-thousand tons of HOOKER CAUSTIC *Coming up!*

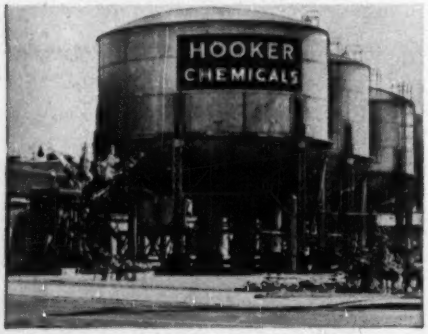


CONVEYORS feed salt to brine tanks for caustic soda and chlorine production in Hooker electrolytic cells.

We will produce more caustic soda this year than ever before in our history.

This would be meaningless, except that it expresses our belief in the future of the chemical industry—and our readiness to keep growing with it as one of your major suppliers of chemical raw materials and intermediates.

Today, more than ever, you can count on Hooker for dependable supplies of caustic soda, chlorine and many other industrial chemicals.



CAUSTIC SODA DISTRIBUTING STATION

5 Reasons for Specifying HOOKER Caustic

1 **Large-tonnage production**—The biggest in nearly 50 years—means dependability of supply for you.

2 **Quality caustic in the form to meet your needs** 50% and 73% liquid; flake; solid. Drums, tank cars, barges. An impressive background of experience in serving large users of caustic.

3 **Technical service**—Willing, competent help in safe handling and use of caustic in your process. Experience gained from serving 30 industries is at your disposal.

4 **Fast, dependable deliveries**—More facilities than ever before for getting caustic to you, on schedule.

5 **If you use caustic in l/c/l quantities,** you can now purchase caustic from a Hooker plant, warehouse or jobber near you. Write us for name and address of your nearest Hooker jobber.

FOR ANALYSES, PRICES, DELIVERY INFORMATION, write Hooker Electrochemical Company, 5 Forty-seventh Street, Niagara Falls, N. Y.—or phone your nearest Hooker sales office.

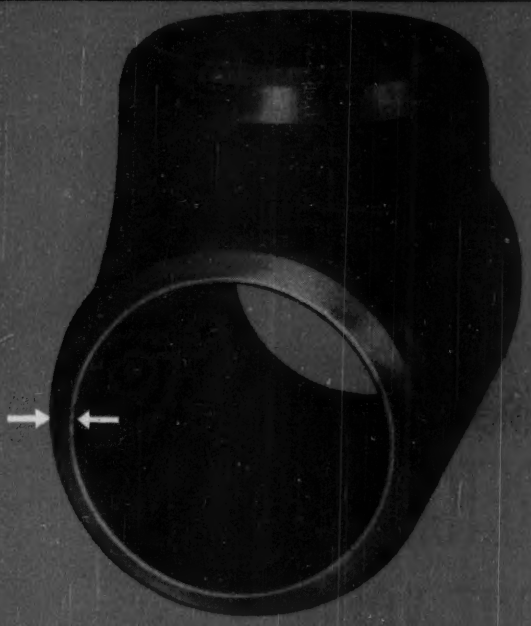
From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

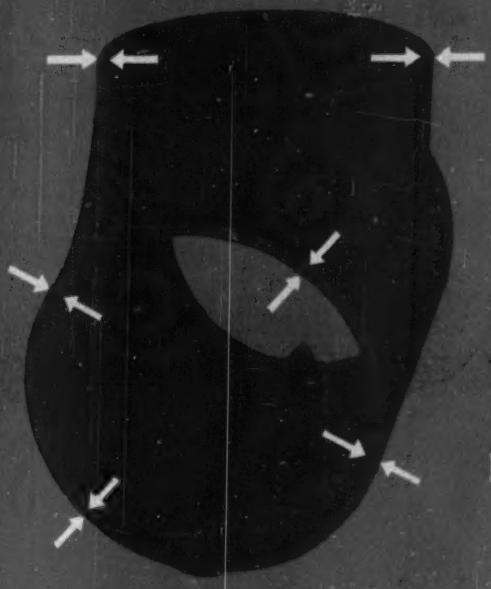
NIAGARA FALLS • TACOMA • NEW YORK • CHICAGO • LOS ANGELES, CALIF.

HOOKER CHEMICALS

EVIDENCE OF SUPERIORITY IN *Corrosive Service*



BEFORE *Midwest 4" extra heavy weight, carbon steel tee showing original wall thickness of tee at right before it was accidentally subjected to corrosive conditions.*



AFTER *When straight pipe in line had failed from corrosion, this Midwest tee was removed. Note amount and uniformity of wall thickness remaining.*

A valve leaked or somebody opened it by mistake . . . so the Midwest Tee shown above was subjected to dilute hydrofluoric acid in addition to its normal service in a 300° F. hydrocarbon line on an alkylation unit.

The highly corrosive acid caused failure of the straight pipe . . . so the entire line had to be replaced. When cut out of the line, the Midwest Tee was found to have a considerable (and uniform) wall thickness. There was no selective corrosion and the weld held up even better than the parent metal.

This was not special alloy made to resist corrosion, but regular Grade "A" carbon steel . . . the same as the new tee shown left above. We do not, of course, recommend carbon steel for corrosive conditions, but, in emergency, it gives good account of itself.

The exclusive Midwest manufacturing process produces fittings of superior metallurgical properties. The metal is worked in compression . . . it is not stretched or extruded, and distribution is uniform. After forming and welding, the fitting is stress-relieved. For further information, write us for a copy of Catalog 48.

MIDWEST PIPING & SUPPLY CO., INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices: New York 7—80 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

IMPROVE DESIGN AND REDUCE COSTS

STRETCH OUT YOUR STAINLESS, TOO

There *are* ways to stretch out your supply of stainless.

For example, you may be using a grade or finish of stainless that is in extreme demand when another similar one, not as tight, could do the job adequately.

Our metallurgical staff and stainless fabricating specialists are ready to help you look into this matter and to advise you on more readily-available types of stainless that will do a satisfactory job. Feel free to call on us for this specialized help.

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

STAINLESS STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

So tough you can drive a nail with it!

USCOLITE . . . U. S. Rubber's famous plastic

This plastic pipe is unbeatable in impact strength. For example, a .44 cal. revolver bullet, fired at a distance of 20 yards, scarcely dented a section of Uscolite piping. This remarkably strong and versatile plastic is resistant to most industrial chemicals. It is lightweight, easy to handle.

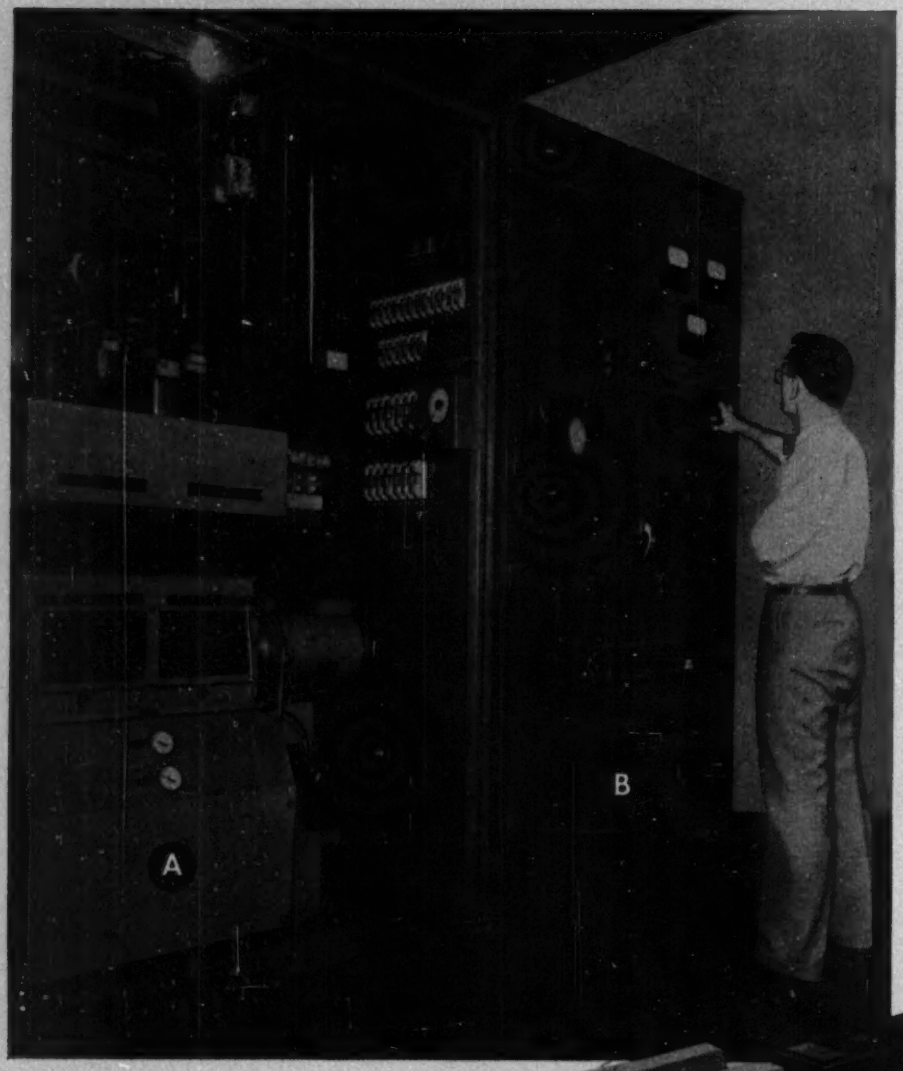
Furnished in standard lengths, Uscolite pipe can be cut and threaded with standard equipment. A complete line of Uscolite fittings is also available, enabling contractors to do a complete on-the-job assembly and installation. For further information, write to address below.

PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

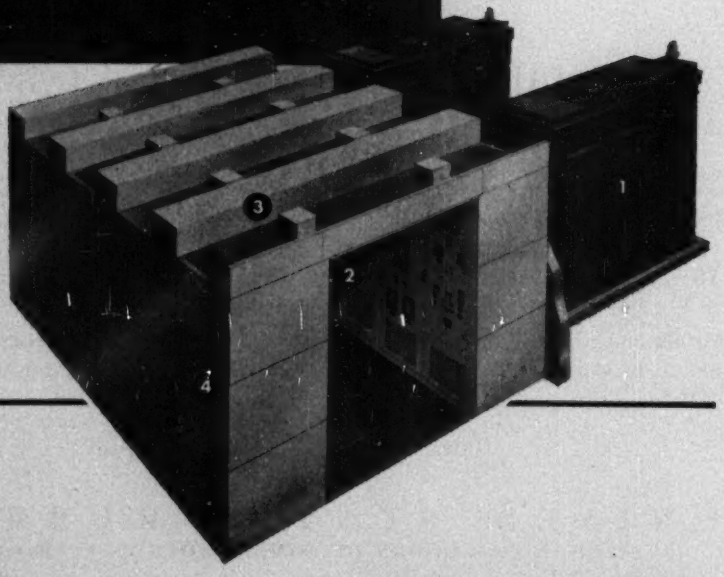
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Heavy d-c current...low d-c voltage



10,000 ampere I.T.E. Mechanical Rectifier supplying d-c to electrolytic chlorine cell line. Note how neatly and compactly the contact mechanism (A) and control panel (B) are arranged.



A complete I.T.E. Mechanical Rectifier installation includes: transformer and commutating reactor (1), contact mechanism (2), overhead bus (3), and d-c switchgear (4). No additional auxiliary equipment is necessary.

..... with highest efficiency!

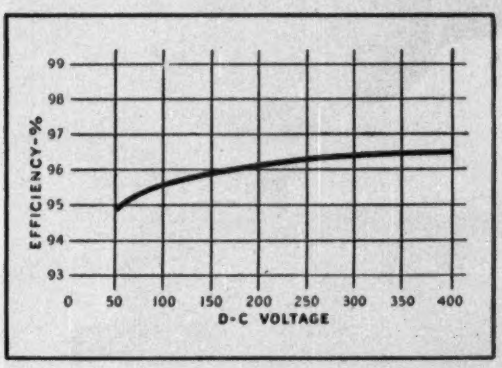


FIG. 1

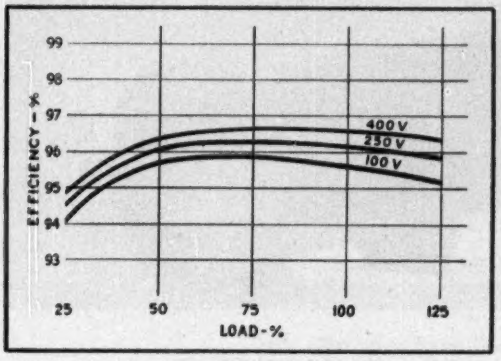


FIG. 2

Send for details

Bulletin 5205 explains how, from a-c line to d-c bus, the I-T-E Mechanical Rectifier gives you efficiency of 96% —and higher. Send for a copy today.

5,000-10,000 d-c amperes—or multiples thereof —available between 50 and 400 volts, with an over-all efficiency of 94%-96%

Chief advantage of the I-T-E Mechanical Rectifier is its consistently high efficiency in the 50-400 volt range. Note (Fig. 1) how high the efficiency is even when operating voltage is as low as 50 v.

Note (Fig. 2) how high efficiency is maintained even at 25% of rated load current.

High efficiency of the I-T-E Mechanical Rectifier is substantiated by thirty-seven units in service—more than 200,000 amperes of connected load.

ADVANTAGES OF LOWER VOLTAGES

Lower operating voltages are less hazardous. Leakage losses to ground, the plague of electrolytic cell lines, are substantially less when operating voltage is under 400 volts d-c. Greater flexibility can be designed into systems. Large or small quantities of electrolytic products can be manufactured economically.

SUBSTANTIAL SAVINGS

High efficiency means big savings. Assume a 10,000 kw load, a power rate of ½ cent per kwhr, and continuous operation at 250 volts d-c. Then, for each 1% improvement in over-all efficiency, yearly savings amount to $3200 or more.

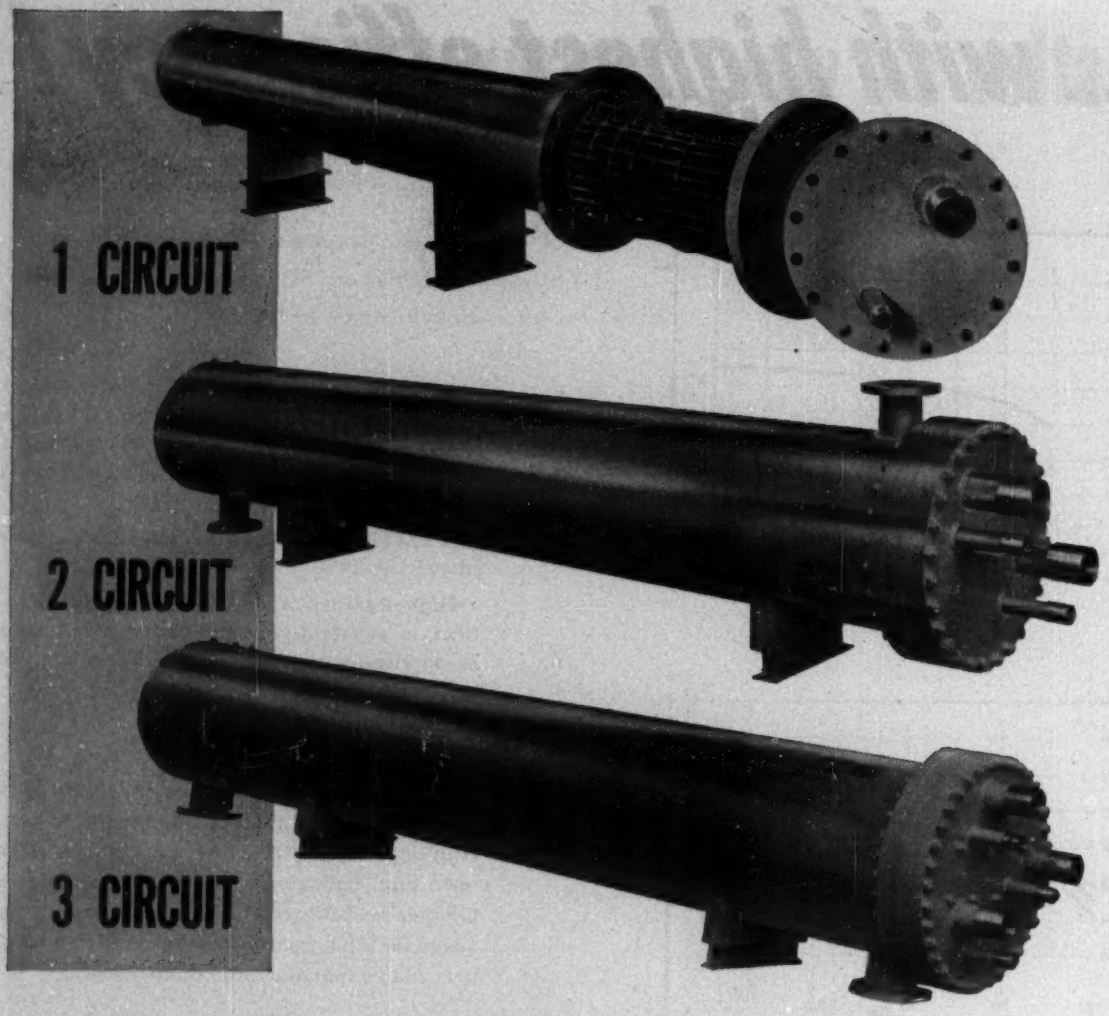
OTHER BENEFITS

The compact I-T-E Mechanical Rectifier saves space. It requires no special buildings, foundations, cooling or ventilation.

MECHANICAL RECTIFIERS

I-T-E CIRCUIT BREAKER CO. • Rectifier Division • 19th and Hamilton Sts. • Phila. 30, Pa.

EPD—Canadian Mfg. and Sales: Eastern Power Devices, Ltd., Toronto



p-k FREON COOLERS

even out fluctuating loads

Here is the sure answer to the problem of fluctuating cooling loads—supplied by **p-k**. One, two or three circuit **p-k** Freon Coolers are specifically recommended to match your load. They are the practical, logical, economical answer to uniform cooling needs. Each type is designed to insure maximum heat transfer efficiency under the particular load conditions specified for the job. Regardless of weather conditions—hot, cold or moderate—**p-k** Freon Coolers will constantly maintain optimum temperature differences and high refrigerating efficiency.

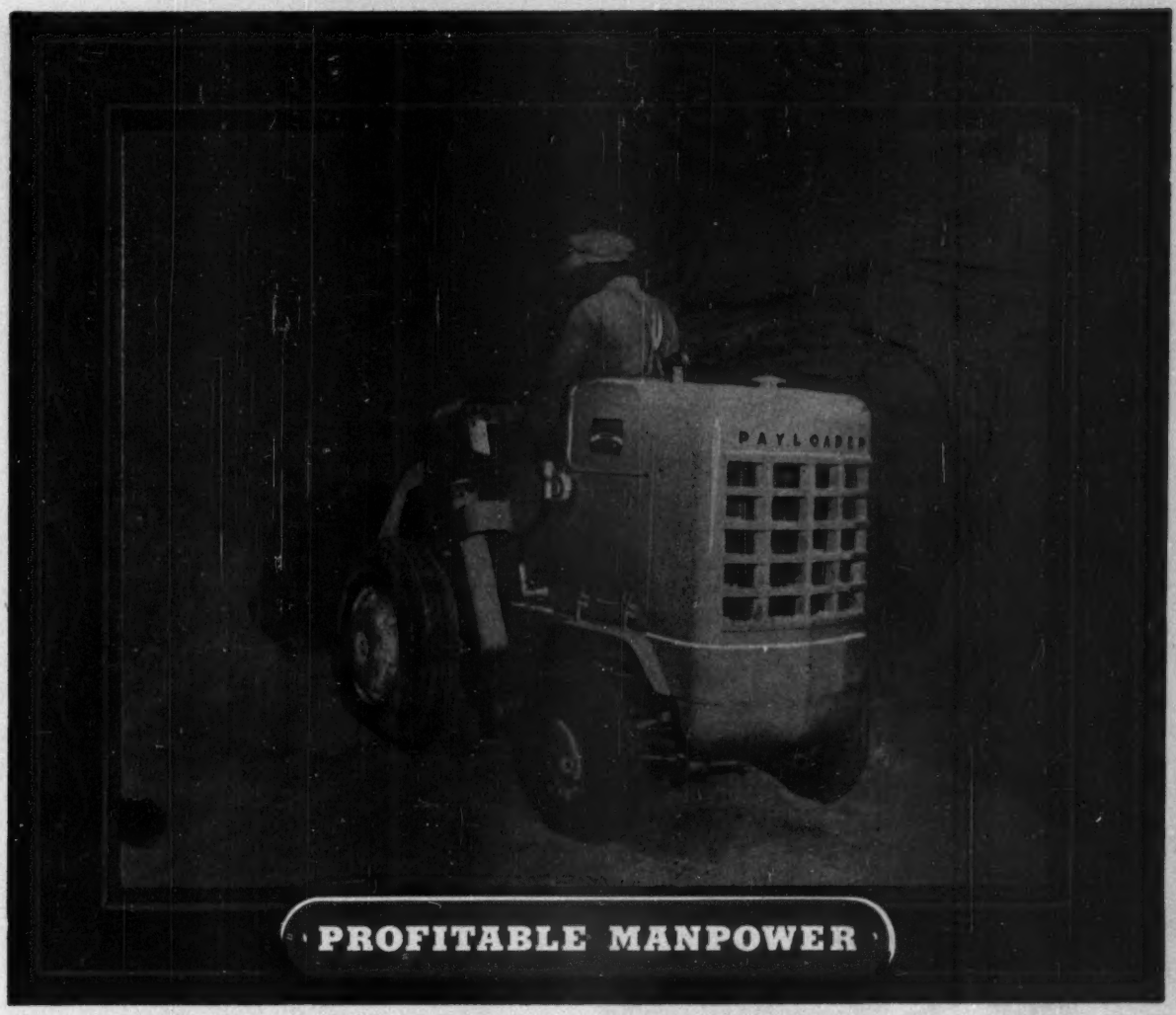
For the best in value and dependable service—plus dependable operating efficiency—it will pay you to know all about **p-k** Freon Coolers. Write today for catalog No. 101 covering size ranges, engineering tables and other important data. Send for it now, for immediate use or later reference.

© 1906

the **Patterson-Kelley Co.,** *Inc.*

120 Lackawanna Ave., East Stroudsburg, Penna.

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities



This man may have been good with a wheelbarrow and hand shovel, but his productive capacity is several times greater as a "PAYLOADER" pilot. He's happier and so is his boss, because they both make more money.

"PAYLOADER" tractor-shovels are helping fertilizer and chemical plants slash production costs. They actually pay for themselves in a few months doing the many jobs listed here . . . doing them faster and cheaper — and release manpower for more productive work.

These special tractor-shovels are available in seven sizes, from 12 cu. ft. to 1½ cu. yd. to master your jobs both indoors and outdoors. Get full facts *now* on cost-cutting, time-saving, production-boosting "PAYLOADER". The Frank G. Hough Co., 754 Sunnyside Ave., Libertyville, Illinois.

FOR MANY JOBS. *Unload box cars — dig and carry fertilizers, chemicals and all loose materials — feed conveyors, hoppers, baggers, elevators — unload trucks — load box cars — carry bagged materials — clean up aisles, gangways — maintain private roadways — stockpile and carry coal — handle ashes — remove snow — spot cars — lift, haul, push, pull.*

PAYLOADER®

THE FRANK G. HOUGH CO. Since 1920

[redacted] and "Industrial Handling" is full of profitable ideas developed by "PAYLOADER" users. A request on your letterhead gets you on the regular mailing list without cost.

DRY FEED

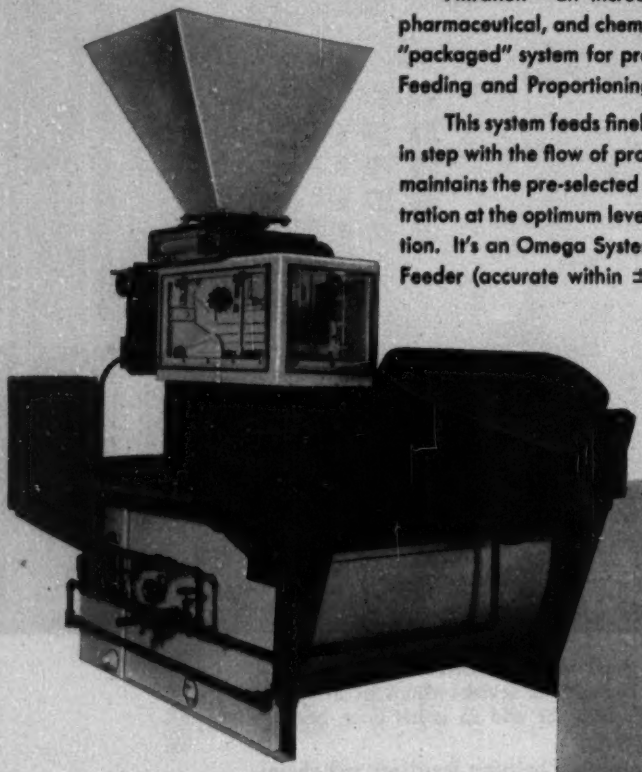
LIQUID FEED

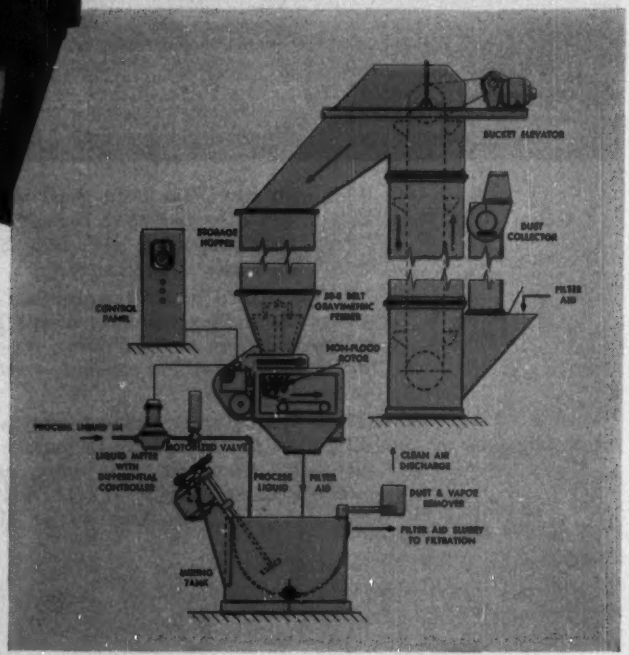
SYNCHRONIZED *Automatic System*

FOR **CONTINUOUS** PREPARATION OF FILTER AID SLURRY

Filtration — an increasingly important operation in the food, petroleum, pharmaceutical, and chemical industries — is put on a mechanized basis with this "packaged" system for preparing filter aid slurry . . . one of the many Omega Feeding and Proportioning Systems available to industry today.

This system feeds finely pulverized filter aid (weighing 7 to 15 lbs. per cu. ft.) in step with the flow of process liquid to the filters. A sensitive synchronizing unit maintains the pre-selected ratio of dry material to liquid . . . keeps slurry concentration at the optimum level . . . eliminates hit-or-miss, high-cost manual preparation. It's an Omega System throughout — from the Model 50-8 Belt Gravimetric Feeder (accurate within ± 1% by weight) to the mixing tank, dust and vapor removal devices, synchronizing mechanism, and control panel. The design and construction of this "packaged" system is 100% an Omega responsibility which relieves the customer of the purchasing and engineering of individual components.





Omega Dry and Liquid Feeders fit into the widest range of continuous processing and blending operations. Tell us about your problems and we will gladly submit recommendations and quotations. Omega Machine Company (Division of Builders Iron Foundry), 369 Harris Ave., Providence 1, Rhode Island.

Continuous slurry preparation system including Omega 50-8 Belt Gravimetric Feeder with positive, non-flood feeding mechanism; mixing tank and agitators; dust collector, bucket elevator, storage hopper; control panel and differential controller.

B·I·F INDUSTRIES

OMEGA

THE LAST WORD IN FEEDERS

Ω OMEGA

Omega manufactures a complete line of volumetric and gravimetric feeders for dry materials and for gravity feeding of liquids and solutions.

PROVED EFFICIENCY makes ANTHRAFILT* #1 Filter Medium!

ANTHRAFILT*

. . . through years of efficient use . . . has become an accepted standard of excellence in the filtering field, so that today it is recognized for its filtering ability, superiority, and the many savings it provides.

ANTHRAFILT* is made from a *selected* Pennsylvania Anthracite low in ash, high in anthraxylon, low friability, and right shape. Its low ash content is further lowered by special cleaning.

USES INCLUDE

RAPID GRAVITY FILTERS
PRESSURE FILTERS
SLOW FILTERS
HOT PROCESS SOFTENING FILTERS
COLD PROCESS SOFTENING FILTERS
SWIMMING POOL FILTERS
OIL REMOVAL FILTERS
ALKALI FILTERS
ACID FILTERS
MECHANICAL SEWAGE FILTERS
REVOLVING SCREEN FILTERS
SEWAGE SLUDGE-BEDS
PORTABLE FILTERS

ANTHRAFILT* provides greater capacity . . . longer filter runs . . . cleaner washings at lower cost . . . removes entrained turbidity from industrial process solutions or wastes.

Write us today for full details and recommendations. A prompt reply is assured.

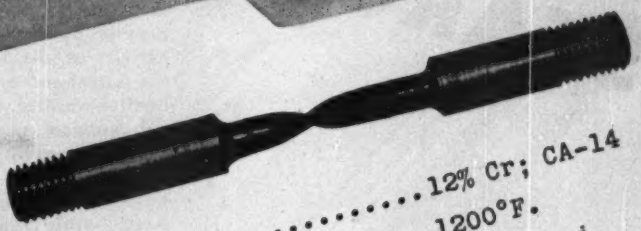
PALMER FILTER EQUIPMENT COMPANY
822 East 8th St., P. O. Box 1696, Erie, Pa.

** Trade Mark Reg. U. S. Pat. Off.*

ANTHRACITE EQUIPMENT CORPORATION
Anthracite Institute Building
WILKES-BARRE, PA.

The Story of a Test

DURALOY



Test Rod.....12% Cr; CA-14
Test Temperature.....1200°F.
Tensile Strength.....38,200 psi.
Elongation (2")..... 29.5%
Reduction in Area..... 86.1%

That's high quality metal! Metal destined for a high alloy casting which has to meet some pretty rigid specifications!

The story we want to tell here is about our Testing Facilities. We have right in our foundry every conceivable testing facility needed when checking static or centrifugal high alloy castings for industry. Where required, we make complete chemical, metallurgical, and mechanical checks and tests. And have both a 400,000 volt X-ray unit and gamma-ray unit, for checking the final casting for hidden flaws.

As we see it, the only way to assure customers of high quality castings is to have and use all necessary facilities for testing and checking the heat, pour and finished casting.

THE DURALOY COMPANY

Office and Plant Scottdale Pa. • Room 39 Office 17 East 48th Street New York 17 N.Y.
Detroit Office: 7310 Woodward Avenue • Pleasant Ridge, Mich.
Atlanta: J. M. TULL Metal & Supply Co. • Chicago: R. C. NELSON 192 S. Michigan Avenue • San Francisco: JOHN D. TENGTMACHER 241 Taylor Street
METAL GOODS CORP. • • •

RESEARCH — PRODUCTION

Baker-developed Platinum Metals Catalysts provide by far the highest yield and catalytic activity at low temperatures and pressures—the purest end-product and most efficient production control. Industrial and pharmaceutical chemical manufacturers are also making the very profitable discovery that Platinum Metals catalysis is in many instances considerably more economical than catalysts of the base metals and oxides—in large as well as small-scale production. Certainly, the possibilities-for-advantage warrant investigation.

. . . FOR A GRAM OR A TON

BAKER RESEARCH AND PRODUCTION SERVICE. Here, the world's largest Platinum Metals Catalyst research and production facilities are maintained for a complete service to industrial and pharmaceutical chemical manufacturers.

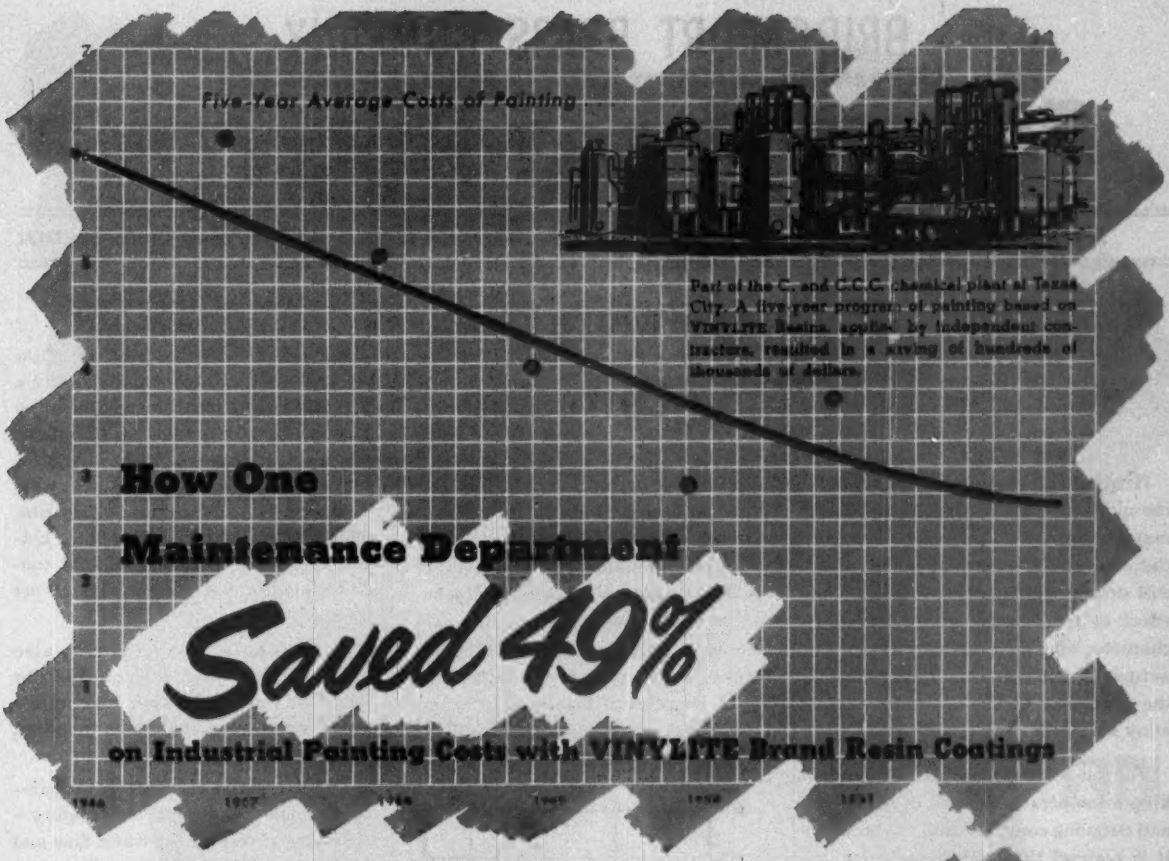
If catalysis is a part of your production or if you are developing a product or process involving a catalytic stage, call a Baker research representative for consultation—in full confidence and without obligation.

Send for new file bulletin "SELECTIVE HYDROGENATION BY PLATINUM METAL CATALYSTS"

BAKER
& COMPANY, INC.
CATALYSTS

113 ASTOR STREET · NEWARK, N. J.

THE HUB OF PLATINUM METALS RESEARCH



Part of the C. and C.C.C. chemical plant at Texas City. A five-year program of painting based on VINYLITE Resins, applied by independent contractors, resulted in a saving of hundreds of thousands of dollars.

How One Maintenance Department Saved 49%

on Industrial Painting Costs with VINYLITE Brand Resin Coatings

Here is a saving of hundreds of thousands of dollars graphically shown on a chemical company's actual cost chart plotted over a five-year period. Painting costs have *decreased steadily every year* since VINYLITE Resin coatings, applied by *experienced independent contractors*, were adopted. The report of a special study reads in part:

> "Use of VINYLITE resin based paint and outside paint contractors has reduced the painting costs on an equivalent basis by 49 per cent since 1946-1947. Use of VINYLITE Resin wash primers and paint on new construction should eventually reduce costs even further."

The toughness and long life of these VINYLITE Resin coatings bring outstanding results for chemical plants, oil refineries, pipelines, dairies, tank cars, marine equipment . . . wherever surfaces are exposed to rough treatment, chemicals, salt water, weather extremes, industrial fumes.

Properly applied, by spray dip or brush, finishes based on VINYLITE Resins won't crack, chip, peel, or fade. They stay put on metal, concrete, masonry. For most practical purposes, they're inert, odorless, tasteless. They come in any color.

These same qualities make VINYLITE Resin coatings ideal for protecting packages and food containers against package deterioration and contamination.

Whatever your plant or product . . . inside or out, you can improve performance as well as cut costs by using coatings based on one of the many BAKELITE or VINYLITE Resins. Your coating supplier has formulations for specialized uses based on BAKELITE phenolic, vinyl chloride acetate and polystyrene resins.

Get the facts now. Write Dept. OS-46 for folder telling more about this case and other case histories of finishes exposed to chemicals.

Vinylite BRAND RESINS

TRADE MARK

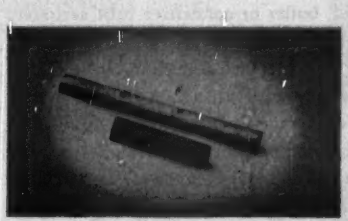
BAKELITE COMPANY

A Division of

Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

Interior wall paints based on BAKELITE Polystyrene Emulsion dry rapidly — yet brush well. Washable, the even coating shows no lapping or brush marks.



Uncoated heat-exchanger tube lasted four months. Lower section, coated with BAKELITE Phenolic Resin baking finishes, was practically unaffected after eleven months.

Contact with corrosive soda ash for fifteen months failed to damage this hopper car's tough, tight-sticking coating based on VINYLITE Brand Resins.

BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION
COPPER ALLOY BULLETIN
"Bridgeport" MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

Effect of Temperature on Condenser Tube Corrosion

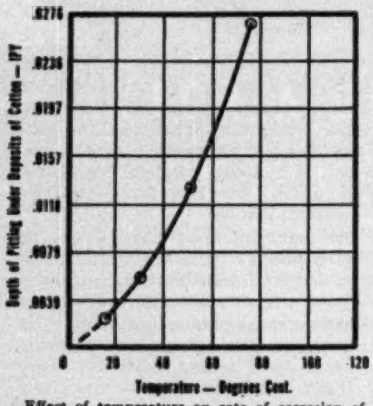
Heat accelerates practically all chemical reactions. Qualitatively, it may be said that a temperature rise of the corroding solution of about 35°F will double the rate of corrosion. The effect of temperature varies with the character of the circulating water, the nature of the corrosive medium, and the condenser or heat exchanger tube alloy involved.

For this reason many plant engineers keep a temperature record of incoming and outgoing condenser waters, because it is realized that a unit operating at too high a temperature will fail prematurely.

The higher temperature of cooling waters during the summer of the year is also one of the factors contributing toward more rapid condenser tube corrosion during this season. Instances have been reported where new condenser tubes installed during the cold winter season have given longer service than new tubes installed during the warm summer. This difference in performance occurs because the type of protective film which forms on a metal in cold water is generally thinner and of a more continuous nature than that which forms in warm water.

In warm and hot waters, the susceptibility towards pitting and dezincification generally increases appreciably. Due to pitting, the useful life of a condenser tube may be considerably shorter than that indicated by the over-all corrosion rate as evaluated by loss in weight or loss in tensile strength. This pitting may be substantially increased by the presence of sulfides in the cooling water especially during the summer season.

In certain waters, the corrosion rate drops off with an increase in temperature because the water deposits a scale. Calcium carbonate forms as a result of the decomposition of calcium bicarbonate at elevated temperatures. If a continuous deposit of calcium carbonate forms, it may protect the underlying metal. However, if breaks occur in this type of impervious scale, pitting is likely to take place on the exposed areas especially when the water velocity is high.



Effect of temperature on rate of corrosion of Admiralty Brass in 3 per cent sodium chloride solutions.

Unfortunately, the build-up of a thick scale on the inside of a water heating coil, boiler or condenser tube seriously interferes with heat transfer. This loss in heat transfer results in considerably higher temperatures on the metal surfaces facing the hot gases or liquid. The high temperature often leads to more rapid corrosion as well as thermal stressing (bending and buckling) and lowering of the creep strength of the metal (cracking or intergranular failures).

Influence of Temperature on Intergranular Corrosion

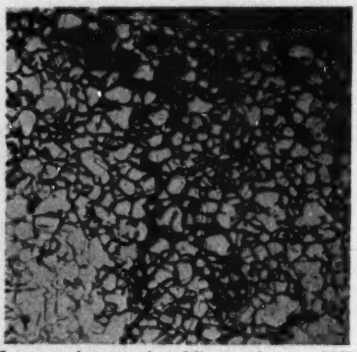
Corrosion sometimes tends to follow the grain boundaries of the metal to a depth of only a few thousandths of an inch which is generally of no serious consequence. However, where intergranular corrosion penetrates the tube wall, it destroys the usefulness of the tube. This condition is most acute in the hottest zone of heat exchangers and condensers when hot corrosive gases are handled.

Intergranular corrosion may also occur on the water side of the tube when the water velocity is low, resulting in a correspondingly high tube wall temperature.

The preventive measure is to maintain a low tube wall temperature—either by increasing the water flow and to remove trash which blocks the tubes. Under these conditions all of the standard copper-base condenser tube alloys give satisfactory service.

However, if a very high water velocity is needed to lower the tube wall temperature, then in order to avoid impingement corrosion, Aluminum Brass, Aluminum Bronze and Cupro Nickel alloys may be needed.

The Bridgeport Corrosion Laboratory will be glad to help you in connection with specifying the alloy which will give you the best service life. Please contact our nearest Bridgeport district office for your condenser and heat exchanger tube requirements. (9497)



Intergranular corrosion. Micrograph mag. 75X.

"ADVERTISEMENT"

WeldELLS®

...have set their own standards

Many of the largest users of Welding fittings refuse to accept any other fittings than WeldELLS.

They have found that when the name, WeldELL, is stamped into a fitting, that fitting can be accepted without question for any service for which it is designed.

They have found that WeldELLS have features that please both the men who design and the men who erect welded piping . . . features that were pioneered by Taylor Forge . . . features that are combined in no other welding fittings.

They have found the answer to their every need in the greater range of sizes, weights and types of the WeldELL line . . . in the broader scope of materials.

Ask for up-to-the-minute facts about WeldELLS and Taylor Forged Steel Flanges.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS, General Offices and Works: P.O. Box 485, Chicago 90, Ill.
Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

TEFLON by ETHYLENE

means VARIETY

Ethylene Chemical Corp. manufactures Teflon in many forms and hundreds of sizes. Your exacting needs can be met with minimum waste because of the variety of Teflon sizes which we can furnish. Send coupon for standard sizes or describe your special needs.

Immediate delivery of standard stock sizes of Teflon rods, sheets, molded and extruded tubing from our plant or from the following distributors:

Abbott & Biddle 2413-27 Federal St. Philadelphia 46, Pa.	Insulating Fabricators 150 Union Avenue East Rutherford, N. J.
Ray Miller Company 4234 Kanawha Tpke. So. Charleston, W. Va.	Ray Miller & Co. 1210 Hays Street Houston, Texas
Nelco Industries 53 W. Jackson Blvd. Chicago 4, Ill.	Jefferson Sales Corp. Kingsport, Tenn.

Pin coupon to your letterhead for a copy of our latest Product & Price List.

ETHYLENE CHEMICAL CORP. (Dept. P1)
245 Broad Street, Summit, New Jersey

Please mail _____ copies of price and size lists to:

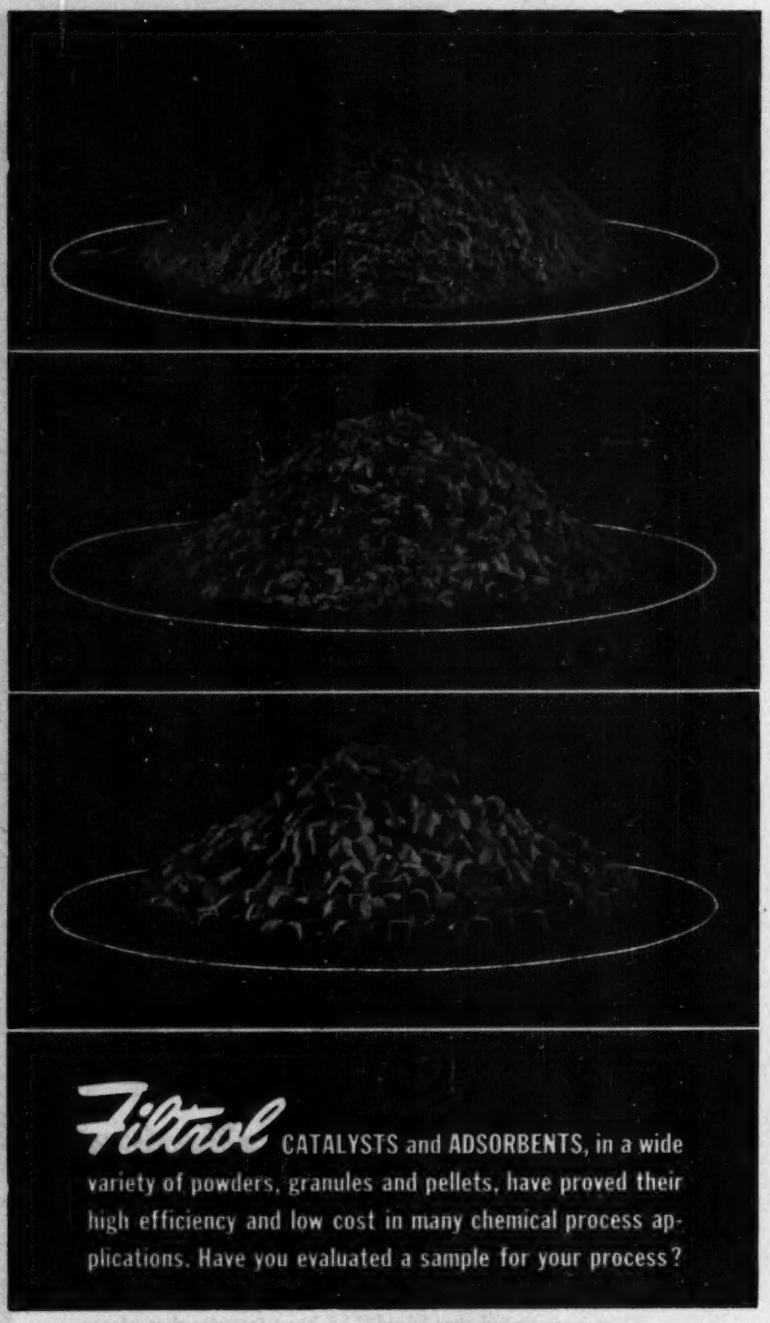
_____
(name and position)

_____

_____

ETHYLENE CHEMICAL CORP

245 BROAD STREET SUMMIT, N. J.



Filtrol CATALYSTS and ADSORBENTS, in a wide variety of powders, granules and pellets, have proved their high efficiency and low cost in many chemical process applications. Have you evaluated a sample for your process?

WRITE TODAY for your copy of the new Filtrol pamphlet which may suggest many new uses to you.

Filtrol *

CORPORATION
CHEMICAL DIVISION

General Offices:
727 West 7th St., Los Angeles 17, California

*T. M. REG. U. S. PAT. OFF.

THE WORLD'S LARGEST MANUFACTURERS OF CATALYSTS, ADSORBENTS, DESICCANTS AND OTHER CHEMICALLY TREATED MATERIALS

BACK IN THE 1880's

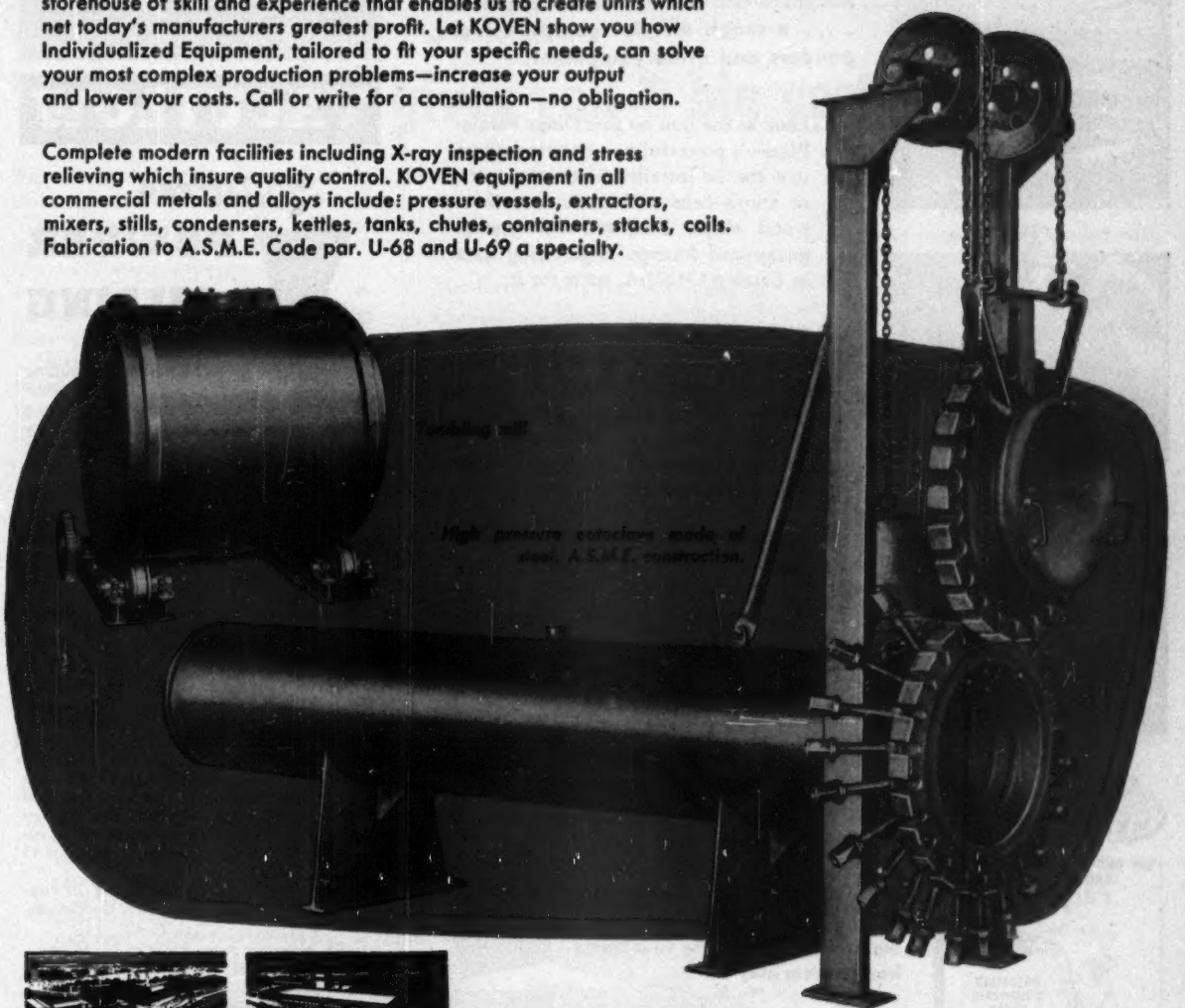
WHEN GRANT BECAME PRESIDENT

Koven

WAS MAKING INDIVIDUALIZED CHEMICAL EQUIPMENT

Linked to the growth of America and its many history shaping events, KOVEN now boasts over 70 years of service to industry. It is this storehouse of skill and experience that enables us to create units which net today's manufacturers greatest profit. Let KOVEN show you how Individualized Equipment, tailored to fit your specific needs, can solve your most complex production problems—increase your output and lower your costs. Call or write for a consultation—no obligation.

Complete modern facilities including X-ray inspection and stress relieving which insure quality control. KOVEN equipment in all commercial metals and alloys include: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, coils. Fabrication to A.S.M.E. Code par. U-68 and U-69 a specialty.



Plants: Jersey City, N. J.

Dover, N. J.

L. O. KOVEN & BRO., INC. 154 Ogden Ave., Jersey City 7, N.J.

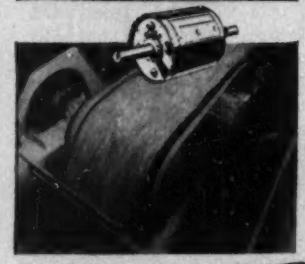
KOVEN FOR INDIVIDUALIZED EQUIPMENT SINCE 1881

Here's why Processing Plants Need—

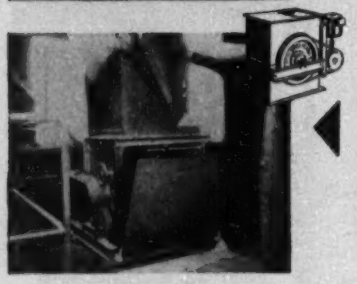
DINGS MAGNETIC PROTECTION...

THE junk above is an actual tramp iron accumulation removed by a Dings Magnet installed in a Wisconsin paper mill . . . a rough diet for pumps, screens, grinders and other equipment.

Look at the iron on this Dings Perma-Plate—a powerful non-electric magnet that can be installed in chutes, ducts, or above belts to remove iron from wood chips. Magnetic Permanence guaranteed forever. Engineering data in Catalog C-1205-A, write for it.



Fully automatic iron removal with a Dings Magnetic Pulley — used here as the head pulley on a chip belt. Iron is discharged separately from chips. Dings Pulleys are unbeatable for power, economy. Write for construction details, capacities.



Dings Non-electric Drum-type Separator installed in ductwork carrying chips separates iron automatically. Perma-Drums can be installed almost anywhere in chutes or ducts. Magnetic permanence guaranteed. Details in Catalog C-1100-A.

RM RECTANGULAR MAGNET

PRESSURE MAGNETIC HUMP

For removing iron from liquid lines, or chutes either the most powerful rectangular magnet made, Dings RM, or a Magnetic Hump equipped with two Dings Perma-Plates. Write for Bulletin 653, and see your Dings representative whatever your tramp iron problem may be.

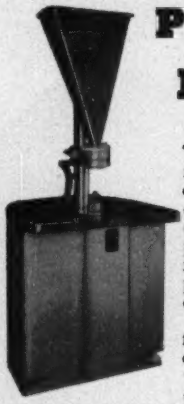
DINGS MAGNETS

DINGS MAGNETIC SEPARATOR CO.

4730 W. Electric Ave., Milwaukee 46, Wis.

VACUFLOW

Dustless POWDER FILLING



The name Vacuflow represents a full line of powder filling equipment which operates on a basic principle of vacuum feeding, instead of pressure, to pack powder into a container.

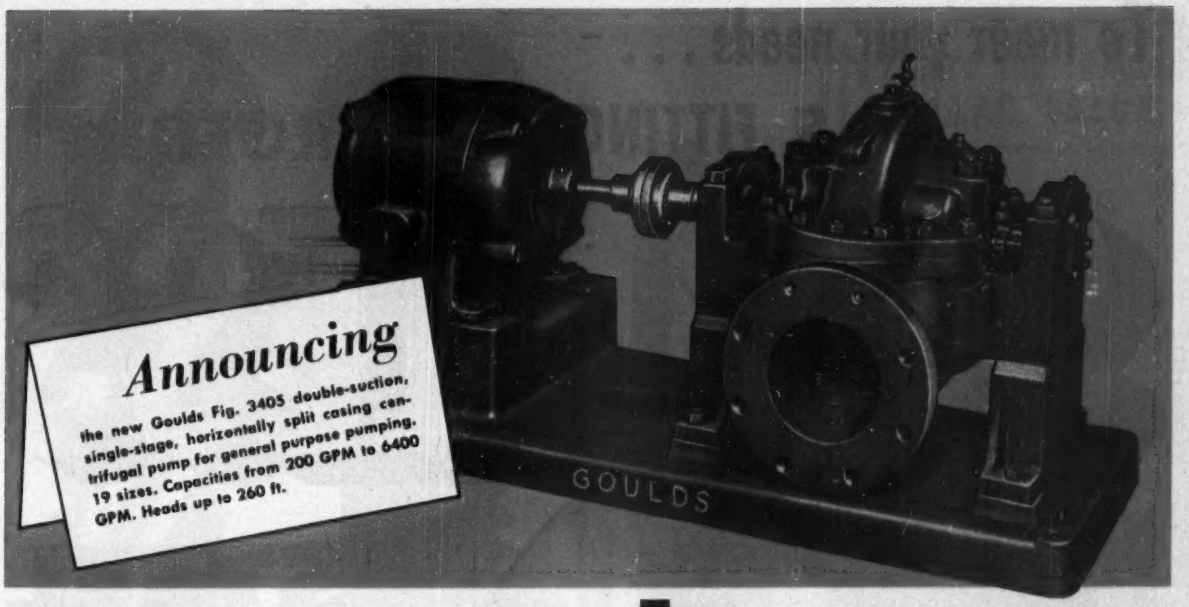
Air is removed from the container to create a vacuum which automatically draws a measured quantity of powder from the hopper. By regulating the powder's density with a predetermined degree of vacuum, a uniform fill is assured. There is no problem with dust control, since the unique Vacuflow method simply does not involve air currents that cause dust.

Semi-automatic models are available for filling containers ranging from the tiny talcum box up to and including 100 lb. paper bags and 200 lb. drums. Rotary models are available for automatic production of 5 lb. sizes or less at speed of 45 to 300 per minute.

Vacuflow will mean lower cost per container in your powder filling operations.

PNEUMATIC SCALE CORP., LTD.
85 Newport Ave., Quincy 71, Mass.
Also: New York; Chicago; San Francisco; Los Angeles; Seattle; Leeds, England

PNEUMATIC


Announcing
the new Goulds Fig. 3405 double-suction, single-stage, horizontally split casing centrifugal pump for general purpose pumping. 19 sizes. Capacities from 200 GPM to 6400 GPM. Heads up to 260 ft.
GOULDS

This new pump gives you 5 big cost advantages

The price you pay is only one element of the cost of a pump installation.

Good engineering practice also figures in the cost of pump breakdowns, low operating efficiency, changeovers to meet new conditions, replacement parts inventories, even the floor space the installation takes up.

Here's why the new Goulds centrifugal pump is designed to improve your cost experience in every one of those elements.

1. *It combines seven design features that mean maximum operating efficiency and minimum maintenance.*

Every one of these construction features is standard with this new design. Together they offer you, without extra cost, a quality of service that's unique in its approach to general liquid handling.

a. Renewable stuffing box bushings.
b. Bearing housings sealed against moisture and dirt.
c. Cowl-type glands suitable for use with quenching liquids.
d. Stainless steel impeller keys.
e. Teflon water seal rings.
f. Die-formed stuffing box packing.
g. Corrosion resistant gland bolts.

2. *Interchangeability of parts.*

With only three shaft and rotating parts assemblies to provide for 19 pump sizes and 38 pump combinations, this new design offers you a remarkable range of interchangeable parts. A glance at the interchangeability chart on page 7 of the descriptive bulletin will show you:

a. how this design gives you great flexibility in making field changes should your pumping requirements change;
b. why the first cost of this unit is so low due to standardization in manufacture; and
c. how this interchangeability helps to reduce spare parts inventories.

3. *Compact construction.*

You will be particularly pleased with the short over-all length of this new design. Short bearing spans cut lengths as much as 50%. This means a real saving in floor space.

4. *Flexibility of stuffing box.*

You can use either conventional stuffing boxes or mechanical seals depending on requirements. And you can change from one to the other in the field if need be.

5. *Easy rotation change.*

A unique device, locking shaft seals, permits you to change from right-hand rotation to left-hand rotation or vice versa in the field without construction changes.

More than 50 years of experience in meeting industry's needs for general purpose centrifugal pumps come to a climax in this design.

GET FULL DETAILS **This 12-page illustrated bulletin, No. 721.6, covers the complete details of the new Goulds Fig. 3405, including specifications, interchangeability tables and performance curves. Be sure you have the whole cost-advantage story before you select another general purpose pump. Contact your nearest Goulds representative or mail the coupon below today.**

Goulds PUMPS INC. Seneca Falls New York

GOULDS PUMPS, INC., Dept. CE, Seneca Falls, N.Y.

Please send me Bulletin No. 721.6 describing the new Fig. 3405 centrifugal pump.

Name_____

Company_____

Address_____

City_____ State_____

To meet your needs . . .

W-S FITTINGS OF FORGED

STAINLESS

STEEL

Standard Design

The "Featherlite"

Stainless systems are critical and costly...Protect them where trouble usually starts . . . with

W-S FORGED STAINLESS FITTINGS

These life-of-the-system joints are available in either screw-end or socket-welding types to meet your *assembly* needs. They're manufactured for stock in the more popular grades to meet your *process* needs. And they're all precision machined from solid STAINLESS Steel Forgings to meet a *universal* need for the strongest, most accurate and trouble-free fittings money can buy.

Get the full benefit of your investment . . . insist on W-S FORGED fittings wherever costly stainless pipe or tubing meet . . . *permanently*.

WRITE FOR BULLETIN S-1 for Standard Design 2,000 to 6,000 pound cold non-shock pressure

WRITE FOR BULLETIN S-2 for "Featherlite" Design 1,000 pound cold non-shock pressure

Screw-End and Socket-Weld Types

• **Tighter** • **Stronger** • **More Uniform** • **Lower Service Cost**

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

ROSELLE, NEW JERSEY

9-M-49

Designers and Manufacturers of Forged Steel Fittings, Hand Pumps, Jacks, Wire Rope Shears and Pipe Benders

HASSALL SERVICE

SPECIAL NAILS RIVETS SCREWS
Hassall
ESTABLISHED 1850

Raw material inventory of Monel, Stainless Steel, Copper and Copper Alloys on hand. Send drawing—advise quantity. Free catalog on request.

JOHN HASSALL INC.
194 Clay Street, Brooklyn 22, N. Y.

Specify and Use MEYERCORD DECALS to...

warn

CAUTION
DO NOT STAND HERE AT ANY TIME WHILE CLUTCH IS ENGAGED AND BALER IS OPERATING.

instruct

BEFORE LOADING WASHER
1. Set Hot Water Tank [illegible] in advance
2. Set Washer Temperatur[illegible]
3. Turn on Washer for ON
4. Spin Out Cold Water

identify

Bendix
AUTOMOTIVE
ELECTRIC FUEL PUMP
MODEL NO. 476089
VOLTS POS. GROUND
U. S. PATENTS
2439770, 2472087, 2553154,
OTHER PATENTS PENDING
ECLIPSE MACHINE DIVISION
BENDIX AVIATION CORPORATION
ELMIRA N.Y. U.S.A.

Low Cost . . . High Speed Application . . . Durable . . . All Colors, All Surfaces

Among the many new applications of decals for American industry is the tough Meyercord acid, chemical and weather resistant identification of dangerous chemical containers. If you process and ship dangerous chemicals, be sure to ask for full information on this important feature.

Meyercord Decals have been adopted by cost-conscious manufacturers in thousands of industries . . . as nameplates, trademarks, instructions, markers, wiring diagrams, safety warnings and many other important industrial applications.

But "just any decal" won't do the job on "just any surface". For today's rigid requirements, Meyercord Decals are carefully laboratory-engineered to assure complete and perfect adhesion to any commercial surface or finish. Write for facts on our technical consultation and designing services.

FREE NAMEPLATE MANUAL

Hundreds of uses for durable, washable decal nameplates . . . as trademarks, instructions, charts, diagrams—in any size, colors, or design. Ask for it on your business letterhead, please.

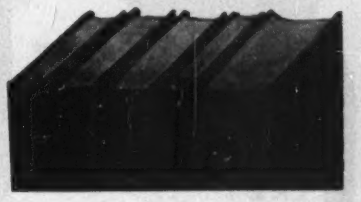
THE MEYERCORD CO.
World's Largest Decalcomania Manufacturers

DEPT. B-312, 5323 WEST LAKE STREET
CHICAGO 44, ILLINOIS

Figure the DOLLAR VALUE

of consistently finding the right answer to chemical plant problems

Think what it would mean to you, in handling any kind of chemical plant operation, to have at your fingertips the know-how and know-what of countless experts who have performed the same and many similar operations. To be able to quickly look up any of thousands of facts that other men have discovered gives you a chance to save your company time, work, and money—to boost your personal value in a way that will be appreciated in dollars. Just such a host of facts can now be at your fingertips, with this data-packed set of books on chemical calculations, economics, unit operations, industrial chemistry, and materials of construction.



McGraw-Hill
CHEMICAL PLANT LIBRARY

5 volumes • 2359 pages • 975 illustrations
JAMES A. LEE, Consulting Editor
Prepared by a Staff of Experts

In these five volumes are literally thousands of facts to aid you in chemical plant engineering, operation, and management. They answer your questions on the manufacture of cements, glass, phosphorus, paints, soaps, sugar and starch, wood chemicals, plastics, and many other chemicals and chemical products . . . cover the principles of chemistry, physics, and thermodynamics, and show the applications of these principles . . . give data, on 300 chemicals and foodstuffs, that show how to combat corrosion . . . include hundreds of tables, charts, diagrams, and equations to aid in making rapid design calculations . . . consider economic factors of research, process development, plant design, and management. The Library is the result of years of experience with chemical plant problems, and the man who has it has the best.

Shreve's Selected Process Industries
Pierce's Chemical Engineering for Production Supervision
Lee's Materials of Construction for Chemical Process Industries
Clarke's Manual for Process Engineering Calculations
Tyler's Chemical Engineering Economics

Gives You:
- A cross section of manufacturing procedures
- Tested facts on 300 different chemicals and foodstuffs
- Data to short-cut process engineering calculations
- Tips on the business side of chemical engineering
- On-the-job assistance in gaining peak efficiency
- Many "how to" helps

SEE IT 10 DAYS FREE

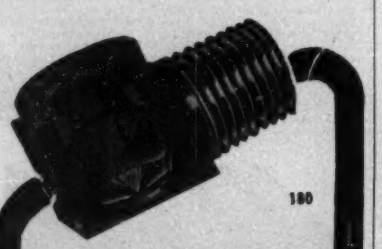
McGraw-Hill Book Co., 330 W. 42, NYC 36

Send me the McGRAW-HILL CHEMICAL PLANT LIBRARY, 5 volumes for 10 days' examination on approval. If the books prove satisfactory, I will remit $8.50 in 10 days and $4.00 monthly until $37.50 is paid. Otherwise I will return books postpaid.

(Print)
Name.....
Address.....
City.....Zone....State.....
Company.....
Position.....CE-2

This offer applies to U. S. only.

DO YOUR SPRAYS CLOG?



180

Available in Brass, Stainless Steel and Hard Rubber — or made-to-order in any machinable material. ¼" to 1" I. P. S.

Advanced design features a single round tangential inlet (instead of several small slots). Relatively large solid particles can pass right through and out the orifice. Produces a hollow cone spray with fine break-up and even distribution—ideal for many types of applications.

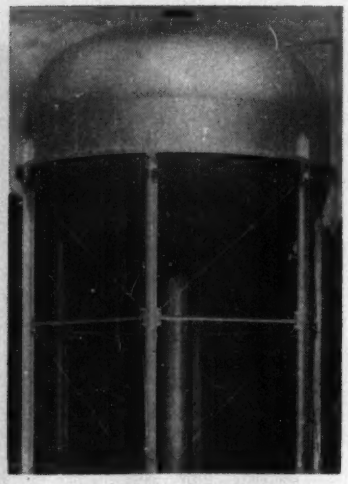
In many industries Monarch Spray Nozzles are used for:

ACID CHAMBERS
AIR WASHING
CHEMICAL PROCESSING
COOLING PONDS
DESUPERHEATING
GAS SCRUBBING
HUMIDIFYING
OIL BURNERS
SPRAY DRYING

Let us send you Catalogs 6A and 6C

MONARCH MFG. WKS., INC.
2517 E. ONTARIO ST.
PHILADELPHIA 34, PA.

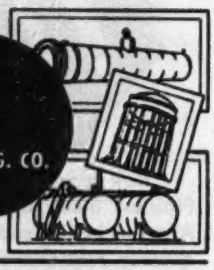
GAS Storage Tanks



• Whether you want conventional high-pressure units or something *special*—send us your inquiries. COLE can build you the kind of high-pressure tanks or vessels you require—any size, any shape, any metal. Our experience (of almost a century) in the design and fabrication of metal tanks may be of help to you. Write for catalog—"Tank Talk"

Established 1854

R. D. COLE MFG. CO.
NEWNAN, GEORGIA



ELEVATED TANKS • VESSELS • CYLINDERS
TOWERS • BINS • STANDPIPES

U S CORP

U.S.I. SOUND POWERED
assures dependable communication

EXPLOSION PROOF

These handsets are approved by Underwriters Laboratories for use in hazardous locations—Class 1, Group D.

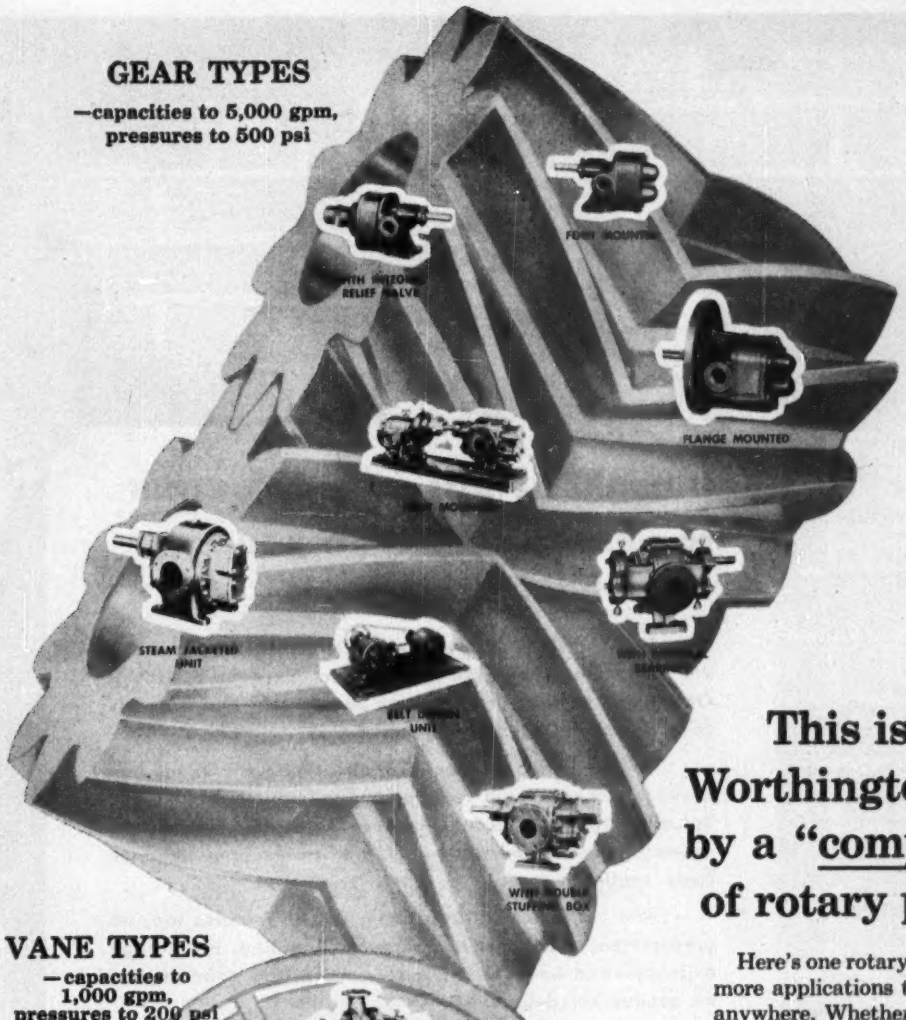
With weatherproof construction, these sound powered handsets may be used for either permanent or portable communication.

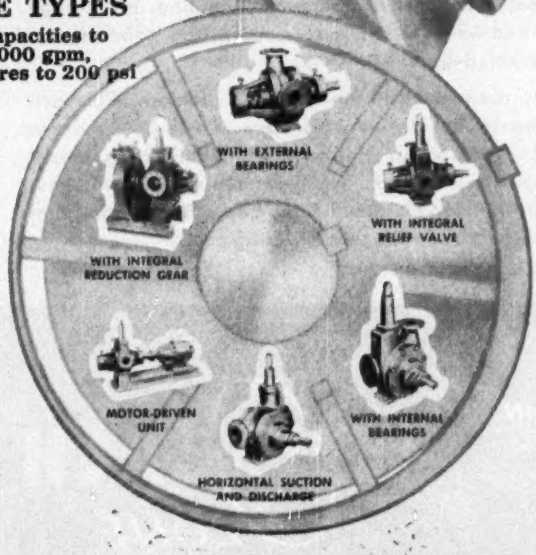
Equipped with press-to-talk switch . . . No batteries, of course.

WRITE DEPT. U FOR CATALOG

No. A 257-2
Approved by Underwriters Laboratories

UNITED STATES INSTRUMENT CORPORATION
SUMMIT • • • NEW JERSEY





This is what Worthington means by a "complete line" of rotary pumps...

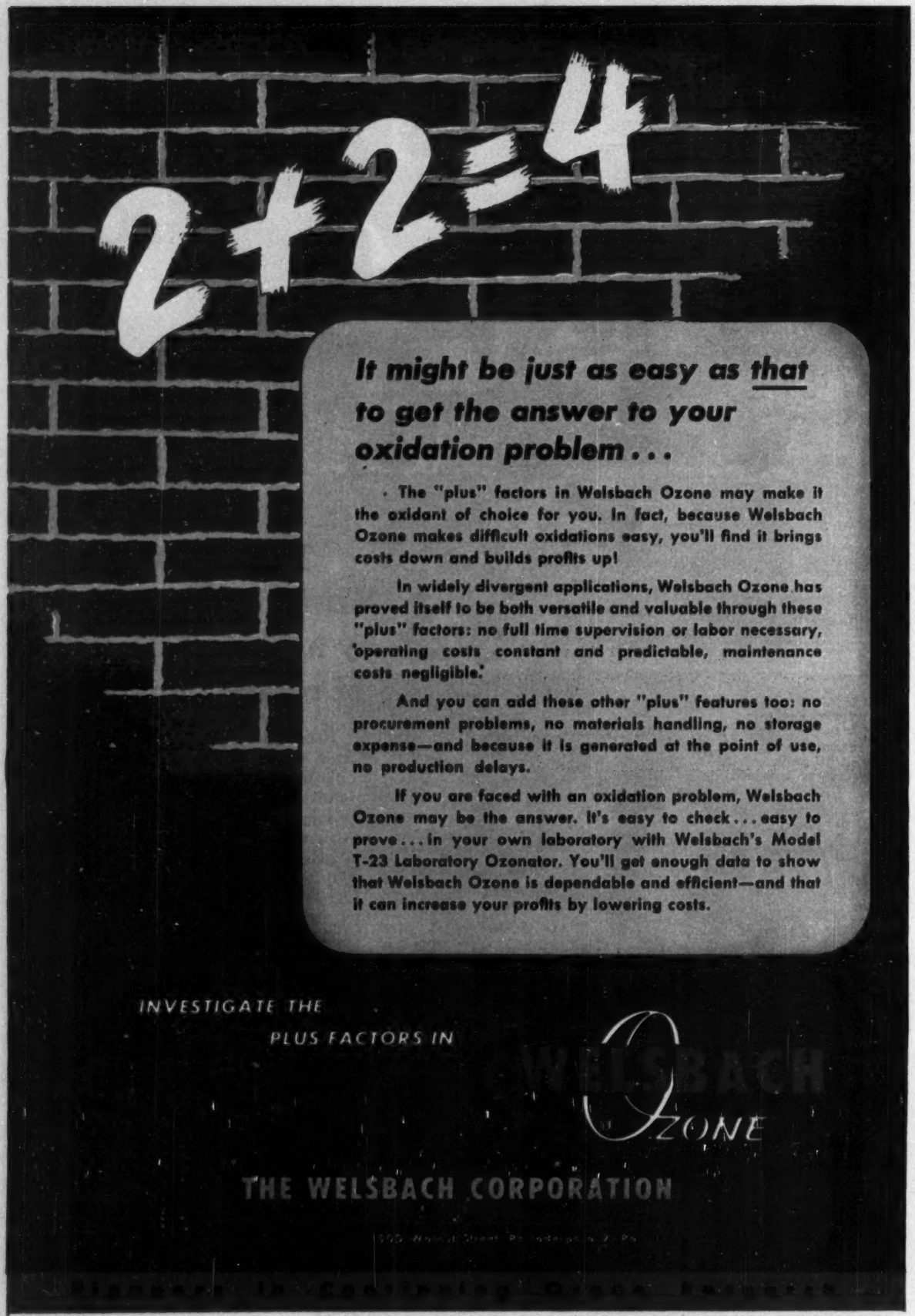
Here's one rotary pump line that covers more applications than any you can find anywhere. Whether you pump thin, non-lubricating liquids or viscous liquids, small or large capacities, low or high pressures, with motor, turbine, engine, belt, or variable speed motor drive, there's a Worthington rotary that'll do your job. Units supplied with either conventional stuffing or mechanical seal. Write for Bulletin W-485-B1 on vane types; W-484-B1A (general service—capacities to 51 gpm, pressures to 100 psi), W-484-B2 (corrosive service—capacities to 51 gpm, pressures to 100 psi), and W-487-B10C (heavy-duty service—capacities to 5,000 gpm, pressures to 500 psi) all heavy-duty gear types. Worthington Corporation, Reciprocating Pump Division, Harrison, N. J.

P.2.4

WORTHINGTON

Rotary Pumps

The World's Broadest Line Assures You the Right Pump for Every Job


2+2=4
It might be just as easy as that to get the answer to your oxidation problem . . .
The "plus" factors in Welsbach Ozone may make it the oxidant of choice for you. In fact, because Welsbach Ozone makes difficult oxidations easy, you'll find it brings costs down and builds profits up!
In widely divergent applications, Welsbach Ozone has proved itself to be both versatile and valuable through these "plus" factors: no full time supervision or labor necessary, operating costs constant and predictable, maintenance costs negligible.
And you can add these other "plus" features too: no procurement problems, no materials handling, no storage expense—and because it is generated at the point of use, no production delays.
If you are faced with an oxidation problem, Welsbach Ozone may be the answer. It's easy to check . . . easy to prove . . . in your own laboratory with Welsbach's Model T-23 Laboratory Ozonator. You'll get enough data to show that Welsbach Ozone is dependable and efficient—and that it can increase your profits by lowering costs.
INVESTIGATE THE PLUS FACTORS IN
WELSBACH
OZONE
THE WELSBACH CORPORATION

EVAPORATION in SECONDS!

The unique Rodney Hunt Turba-Film Evaporator gives incredibly fast *one-pass* evaporation of liquids, slurries and gases... especially heat-sensitive substances... all by continuous process!

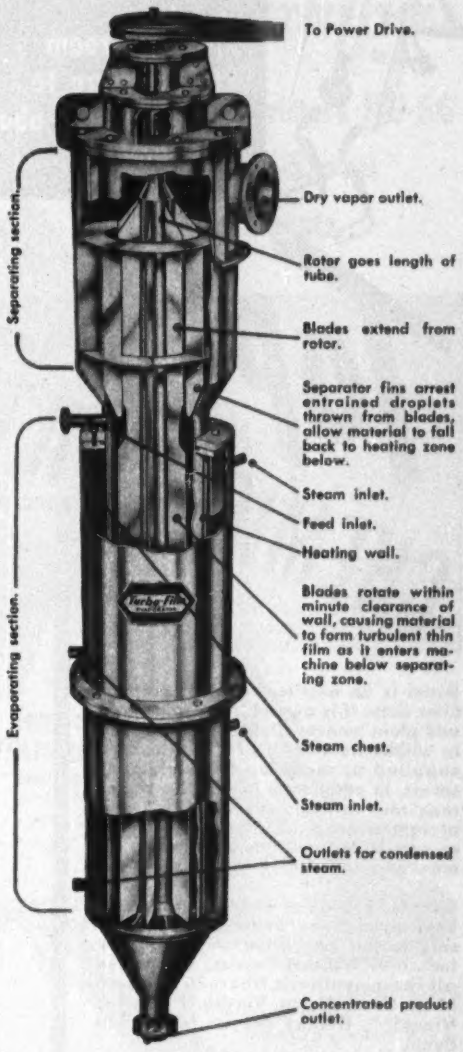
The Turba-Film Evaporator employs a totally different concept of evaporation. Makes heretofore extremely difficult evaporating processes simple and rapid. Actually evaporates most substances in a few seconds!

Here's how the patented Turba-Film® works. The substance to be evaporated is fed into the evaporating section. Here it is whirled against the wall by controlled-speed rotor blades. This forms a thin turbulent film, centrifugally held to the wall, which spins in a gravity flow through the chamber and out... completing the process. The vapors rise into the separating section where rotor blades beat out any entrained droplets and force them back through the evaporating section.

So thorough is this Turba-Film process that no substance requires re-circulation... the desired concentration is achieved in one pass! So fast is the Turba-Film action that proper heating is done in seconds. Colors, flavors, nutritional and other valuable properties are retained to a much higher degree... especially in heat-sensitive substances.

Because of its new principle, the Rodney Hunt Turba-Film Evaporator (Luwa Process, Switzerland) permits quick change-over from one product to another; prevents foaming and frothing difficulties; allows constant quality control to be maintained; permits concentration to very much higher viscosities and solids content than is practical with conventional equipment.

Please consider our complete engineering staff at your disposal for consultation on any possible Turba-Film application. We have the facilities for making test runs in our pilot plant: or we can provide a portable laboratory unit for use in your own plant. Mail this coupon for free color brochure explaining the Turba-Film Evaporator in detail.


To Power Drive.
Separating section.
Dry vapor outlet.
Rotor goes length of tube.
Blades extend from rotor.
Separator fins arrest entrained droplets thrown from blades, allow material to fall back to heating zone below.
Steam inlet.
Feed inlet.
Heating wall.
Evaporating section.
Blades rotate within minute clearance of wall, causing material to form turbulent thin film as it enters machine below separating zone.
Steam chest.
Steam inlet.
Outlets for condensed steam.
Concentrated product outlet.

Models available in ranges from 40 to 2500 pounds of water evaporation per hour. Stainless steel construction.

RODNEY HUNT®

Manufacturing Engineers since 1840

RODNEY HUNT MACHINE COMPANY

Process Equipment Division

31 Vale Street, Orange, Massachusetts

RODNEY HUNT MACHINE COMPANY
31 Vale Street, Orange, Mass.

Please send Free brochure giving details of Turba-Film Evaporator

Name.....Title.....

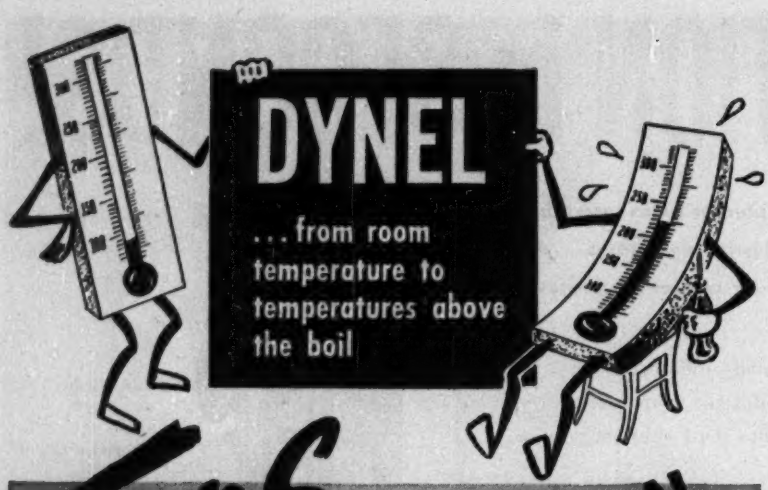
Company.....

Address.....

City.....Zone.....State.....

Type of Industry.....Product.....

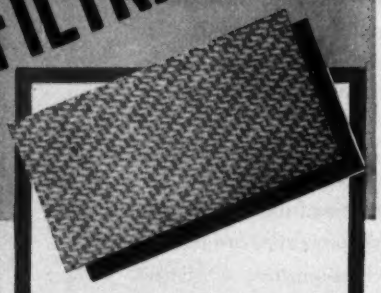
☐ I want details on your testing program. CE 2-53



DYNEL

... from room temperature to temperatures above the boil

Tops for broad-range CHEMICAL FILTRATION



Dynel is an excellent general purpose filter cloth. It is available in twill, chain and plain weaves. Dynel can be woven in widths from 26" to 72" and can be supplied as made up filter element covers. In addition to its high degree of resistance to many chemicals (see box at right) Dynel is not affected by mildew or other fungi and has outstanding dimensional stability.

Over forty years of weaving experience have given us the "know how" so necessary to the production of top quality Industrial Filtering Fabrics. We weave all these synthetic fibers in our own plant: Glass, Nylon, Vinyon N*, Saran, Vincel**, Orlon† acrylic fiber, and Dynel.

Write us about your requirements. We'll be glad to send you test samples and to give you the benefit, without obligation, of the knowledge we have accumulated in our many years of servicing the processing field.

*TM—UCC
**TM—NFMC (applied for)
†TM—E. I. du Pont de Nemours

DYNEL shows excellent resistance to many chemicals, including the following:

- Acetic Acid
- Formic Acid
- Sulphuric Acid
- Hydrochloric Acid
- Nitric Acid
- Phosphoric Acid
- Sodium Hydroxide
- Sodium Bichromate
- Ferric Nitrate
- Zinc Chloride

Weavers of Industrial Filter Media for over Forty Years

The National Filter Media Corp.

General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill.	Cincinnati, Ohio	Houston, Texas	Oslo, Norway	Johannesburg, South Africa
2627 West 19th St.	Roselawn Center Bldg.	1406 Second National Bank Bldg.	Nicolai Friis	Edward L. Bateman

"THIS LUBRICANT SAVED US $2,098·16 IN SEVEN MONTHS"

—says THE BROWN COMPANY
Quality Paper Makers of Berlin, N. H.

"During a seven-month period before using LUBRIPLATE No. 130-AA in the bearing of our Kraft Mill Lime Kiln, we used a conventional oil at a cost of $2,134.00. In the seven months that followed, we used LUBRIPLATE No. 130-AA for initial filling and replacement at the cost of $35.84."

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

MECHANIZE MATERIALS HANDLING

WITHOUT COSTLY INSTALLATIONS OR LOSS OF PRODUCTIVE TIME

use an Allis-Chalmers HD-5G and Tracto-Shovel Attachments

LIFT FORK ATTACHMENT
Stacking Height (under forks) - - 106 in.
Lifting Capacity - - - - - 4,000 lb.

CRANE HOOK
Lifting Height (hook to ground) - - 138 in.
Lifting Capacity - - - - 5,000 lb.

You speed materials handling "right now" when you put this fast-working tractor-shovel combination on the job. The HD-5G starts boosting production without waiting for costly installations or changes in plant layout. Digs into the toughest jobs, indoors or out . . . lifts, loads, excavates, pushes, tows... handles all materials, bulk, solid or packaged.

And it works easily in close quarters — turns in its tracks . . . has no bulky, overhead structure. Outdoors, the track-type tractor is not bothered by weather or ground conditions . . . works the year around, even in unpaved yards.

Choice of thirteen interchangeable Tracto-Shovel attachments makes the HD-5G a one-tractor material handling fleet. Special buckets, lift fork, crane hook, rock fork, 'dozer blades and others may be interchanged in a few minutes with simple tools.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HD-5G THE MODERN TRACTOR IN EVERY WAY
Designed For Your Job • Built To Take It • Easy To Service
Easy To Operate
40.26 drawbar hp. • 1 cu. yd. bucket
Dumping height — 9 ft., ⅛ in.

ALLIS-CHALMERS TRACTOR DIVISION
1127 South 70th St., Milwaukee 1, Wis.
Please send me literature on the Tracto-Shovel line ranging from 1 to 4 cu. yd.

Name_____
Title_____
Company_____
Address_____

IT LASTS LONGER . . . That's why Homoflex Hose saves you money. Workmen like it because they don't have to "fight" it. It's light, flexible, easy to handle, with no pre-set twist . . . and very strong for handling air, water, other fluids and gases. In addition to all this, R/M engineers found a way to make the parts of Homoflex Hose inseparable—adding still more to the life of the hose. If you want to lower your hose costs just raise your standards to Homoflex . . . Ask the R/M Distributor for Bulletin 6879. He'll tell you about other R/M hose types for steam, oil, suction, chemicals . . . also how you get MORE USE PER DOLLAR with R/M transmission, and conveyor belt and V-belts.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls

ACCURACY

of Regulation.....

Just as the champion bowler maintains *top* control when he chalks up a "strike", the Leslie team wraps up perfect performance in LESLIE Temperature Regulators.

There's a LESLIE Regulator for every temperature control problem—designed to meet the demand for accurate, reliable, constant temperature regulation.

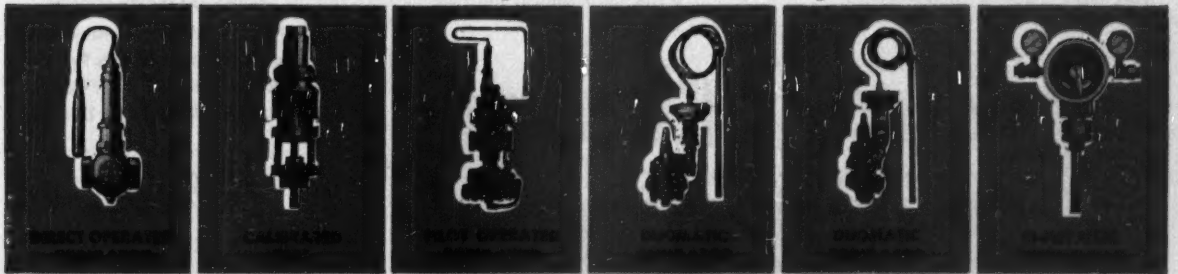
It will pay to explore the advantages of—

TRADE LESLIE MARK

- **Single Seated Construction**
- **Calibrated Dial Adjustment**
- **Duomatic Control**
- **Liquid Filled Elements**
- **Other Leslie Features**

All described in Bulletin 464, available on request.

LESLIE CO., 279 Grant Avenue, Lyndhurst, New Jersey



QUALITY REGULATORS FOR OVER HALF A CENTURY

Complete Acid-Proofing Service...

FOR CHEMICAL PROCESSING PLANTS

EL CHEM offers a complete service covering every type of acid handling and storage unit and every type of corrosive. This service includes *design* and complete responsibility for installation — by your own contractors, supervised by our engineers — or by our own crews.

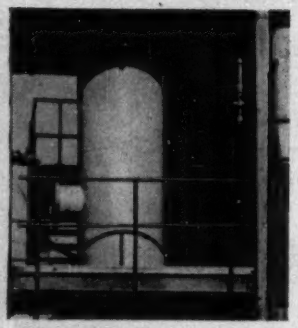
Your advantage in concentrating entire responsibility on a single source is obvious. Construction is speeded up. Units are ready for service usually much sooner. And there can be no alibis.

EL CHEM *Materials* are proof against, not merely *resistant* to every kind of corrosive encountered in chemical, steel, textile and food processing.

EL CHEM *Construction* withstands thermal and mechanical shock.

With more than thirty-six years experience, reflected in installations in some of the largest chemical and steel plants, EL CHEM has developed many new proofing materials and more efficient methods of application.

We maintain an active research department and our engineers are ready to study your corrosion problem, make recommendations and prepare plans and estimates—without obligation.



Scrubbing tower handling hydrofluoric acids and solvents at 200° F., 40 p.s.i. steel shell. Duro-Line membrane. Lecite joined brick lining.

Part of 25,000 sq. ft. of floor. ELCHEM Lecite and glass cloth membrane under 1½" floor brick joined with Lecite.

EL CHEM MATERIALS INCLUDE

LECITE — *Furan cement.* Withstands all acids, except oxidizing ones; all alkalis, fats, oils, greases and most organic solvents — and temperatures up to 375° F.

SYNTHO — *Phenolic cement.* For services including mild oxidants.

BRIMSTO — *Plasticized sulphur base cement.* Quick setting. Withstands all inorganic acids (except strong chromic and hydrofluoric), and mild alkalis, at temperatures up to 200° F. For hydrofluoric, with or without nitric, use CARBON-BRIMSTO.

DURO-XXX — *Silicate, quick setting cement.* Impervious to all mineral acids, except hydrofluoric.

DURO-BOND — *Seamless natural rubber lining.* Compounded to meet specific requirements of unit.

DURO-SAN — *Saran rubber lining.* Applied in sheet form. Resists acids, solvents and oxidizing acids.

DURO-PRENE — *Seamless Neoprene synthetic rubber lining.* Vulcanizes at room temperature.

Remember!

EL CHEM not only makes the best in corrosion-proofing materials, but backs them with a *complete service.*

Write for technical bulletin.

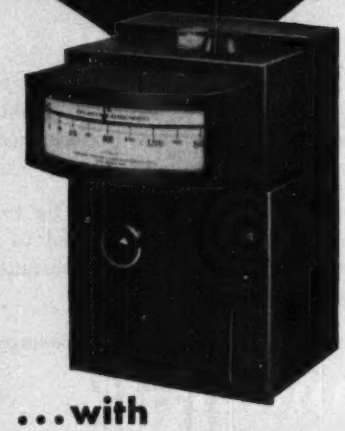
ELectro CHEMical

ENGINEERING & MFG. CO.

752-A Broad Street • Emmaus, Pa.

Manufacturers of acid and alkali-proof cements, linings and coatings since 1912

Electronic Temperature Control



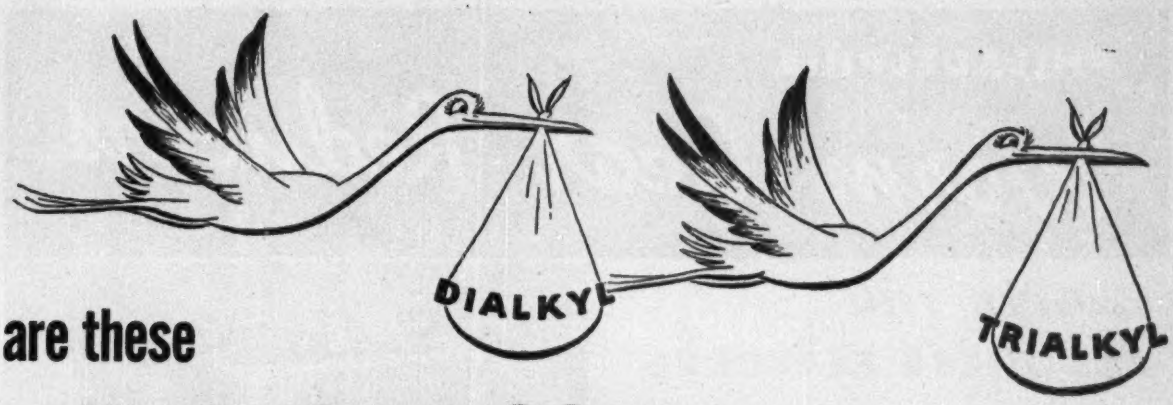
...with ALNOR ACCURACY

Alnor, pioneer in the field of electronic temperature instruments, brings you automatic, precise temperature control for heat-treating furnaces, bake ovens—in fact, for any heating device whether electrically heated or fuel fired. It's the Alnor Temperature Controller—simple in design and operation, its accuracy proved on thousands of installations in many industries.

Easily and quickly installed, this instrument is ready to give you accurate controller service on new or existing heating equipment temperature—you merely set the pointer at the desired temperature and forget your indicating and controlling problems. But find out for yourself how Alnor accuracy and dependability can serve you in controller service; write today for complete details on the Alnor Temperature Controller . . . Alnor accuracy at a price you can afford. Illinois Testing Laboratories, Inc., Rm. 559, 420 N. La Salle Street, Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY



are these alkyl phosphites your blessed event?

DIALKYL and **TRIALKYL** PHOSPHITES are new arrivals in the chemical world... so new that their full possibilities have not yet been developed. Perhaps their birth may represent a "blessed event" in your particular field. It will pay you to examine the interesting properties of these new organic compounds.

Laboratory tests indicate these and many other use opportunities:

...As intermediates in the synthesis of other organic phosphorus compounds.

...As additives to lubricating oils, to serve as corrosion inhibitors, stabilizers, and antioxidants.

...In extreme pressure lubricants, to improve such factors as viscosity, film strength, load carrying capacity, penetrability, and to retard wearing, scuffing and seizing of bearing surfaces.

...As stabilizers, plasticizers, and antistatic agents.

All of the Alkyl Phosphites listed in the table below are available in commercial quantities. Samples and technical literature are yours for the asking. Simply request these on your company letterhead.

VC CHEMICALS ®

DIALKYL HYDROGEN PHOSPHITES	Boiling Point	Specific Gravity	Flash Point, Cleveland Open Cup	Solubility in Water
DIMETHYL	72-3°C/25 mm	1.200	205°F	Soluble. Hydrolyzes.
DIETHYL	65-6°C/6 mm	1.079	185°F	Soluble. Hydrolyzes.
DIBUTYL	118-9°C/7 mm	0.995	250°F	Slightly soluble. Slowly hydrolyzes.
DI-2-ETHYLHEXYL	163-4°C/3 mm	0.937	330°F	Insoluble. Very slowly hydrolyzes.

All possess good thermal stability. Miscible with alcohol, ether, and most of the common organic solvents.

TRIALKYL PHOSPHITES				
TRIETHYL	65-6°C/24 mm	0.969	130°F	Slightly soluble. Hydrolyzes.
TRI-2-PROPYL	84-6°C/50 mm	0.914	168°F	Insoluble. Slowly hydrolyzes.
TRIBUTYL	118-21°C/7 mm	0.925	250°F	Insoluble. Slowly hydrolyzes.
TRIHEXYL	135-41°C/0-2 mm	0.867	320°F	Insoluble. Very slowly hydrolyzes.
TRI-ISO-OCTYL	161-4°C/0-3 mm	0.891	385°F	"
TRI-2-ETHYLHEXYL	163-4°C/0-3 mm	0.902	385°F	"

All possess good thermal stability. Miscible with alcohols, benzene, ether, heptane, carbon tetrachloride, and most of the common organic solvents.

Elemental Phosphorus
Phosphoric Acids
Trisodium Phosphate
Disodium Phosphate-Anhydrous
Tetrasodium Pyrophosphate
Sodium Tripolyphosphate
Ferrophosphorus
Sodium Metasilicate
Tetraethyl Pyrophosphate
Alkyl Phosphites

Other Organic Compounds of Phosphorus

VIRGINIA-CAROLINA CHEMICAL CORPORATION

Chemicals Division: **401 East Main Street, Richmond 8, Virginia**

PHILADELPHIA

Worm Gear Reducers

...GIVE YOU ALL THESE FEATURES

Worms are of alloy steel with carburized, hardened and tempered threads (both shaft and threads are accurately ground *after* heat-treatment.)

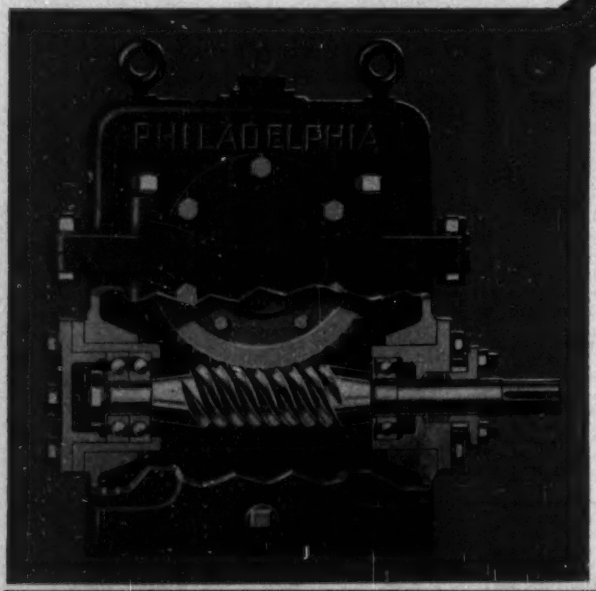
Worm Gears are of highest quality chill-cast nickel bronze.

Bearings are anti-friction types (ball or roller) best suited for smooth, quiet, long-lived operation.

Housings are Quality Grey Iron, compact, rigid, neat and of ample radiating surface (to prevent overheating).

Lubrication is by Splash Systems to all moving parts—in oil-tight housing.

A.G.M.A. Ratings are carried by all Philadelphia Units.



Units are available with *Worms above or below the Worm Gear* for Horizontal Drives, or with shafts extending *up or down* for Vertical Drive requirements . . . all in single or double reductions. And, for very efficient Right Angle Drives, there is a complete line of Philadelphia *Helical-Worm Gear Reducers.*

For Vertical Drives requiring long unsupported shafts, there is a complete line of Type VTS Units, known as *Philadelphia Vertical Steeple-Type Worm Reducers.*

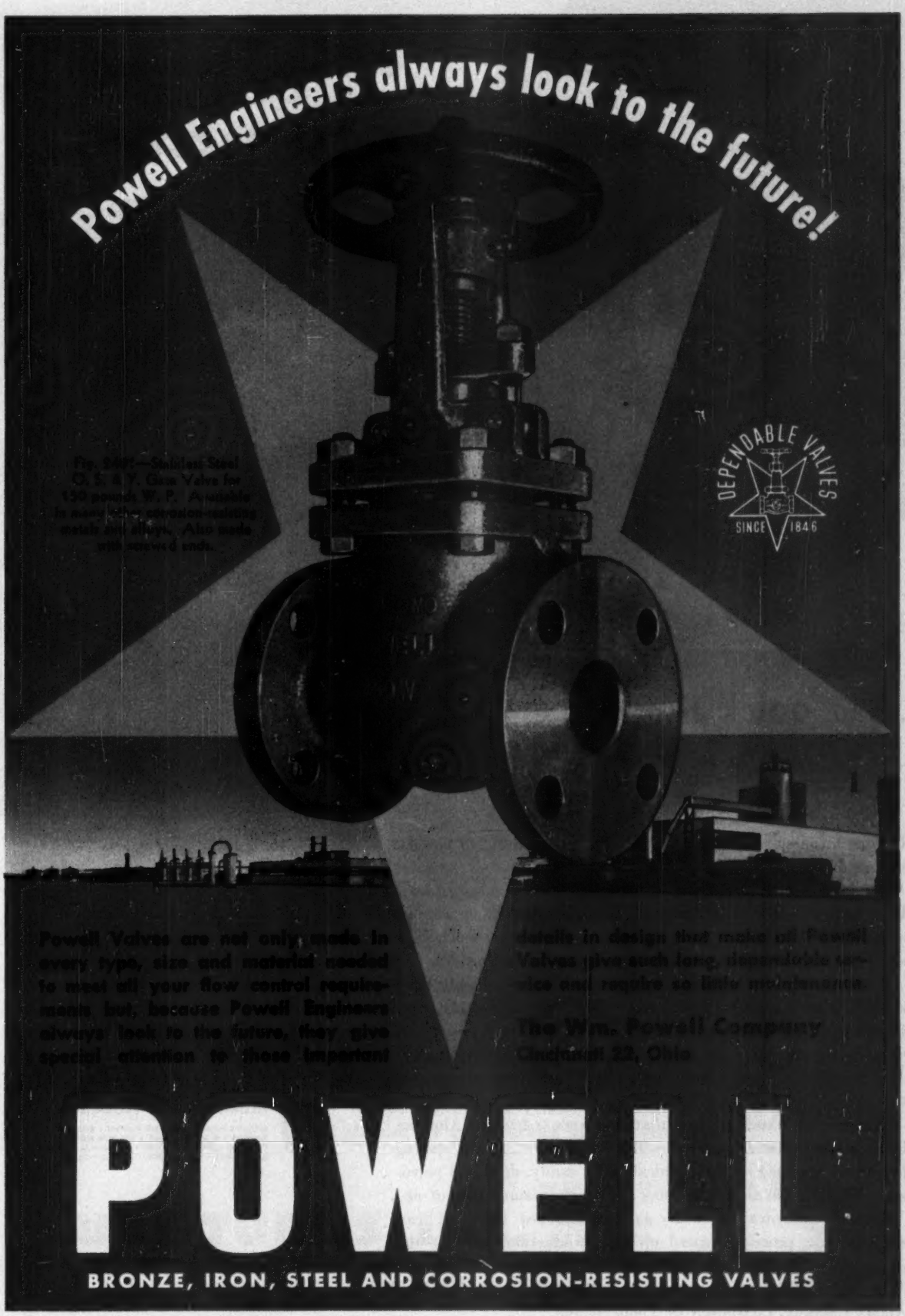
Send for 88 page *Worm Reducer Catalog,* which gives full data for ordering; diagrams; installation views; section views of all units, etc.

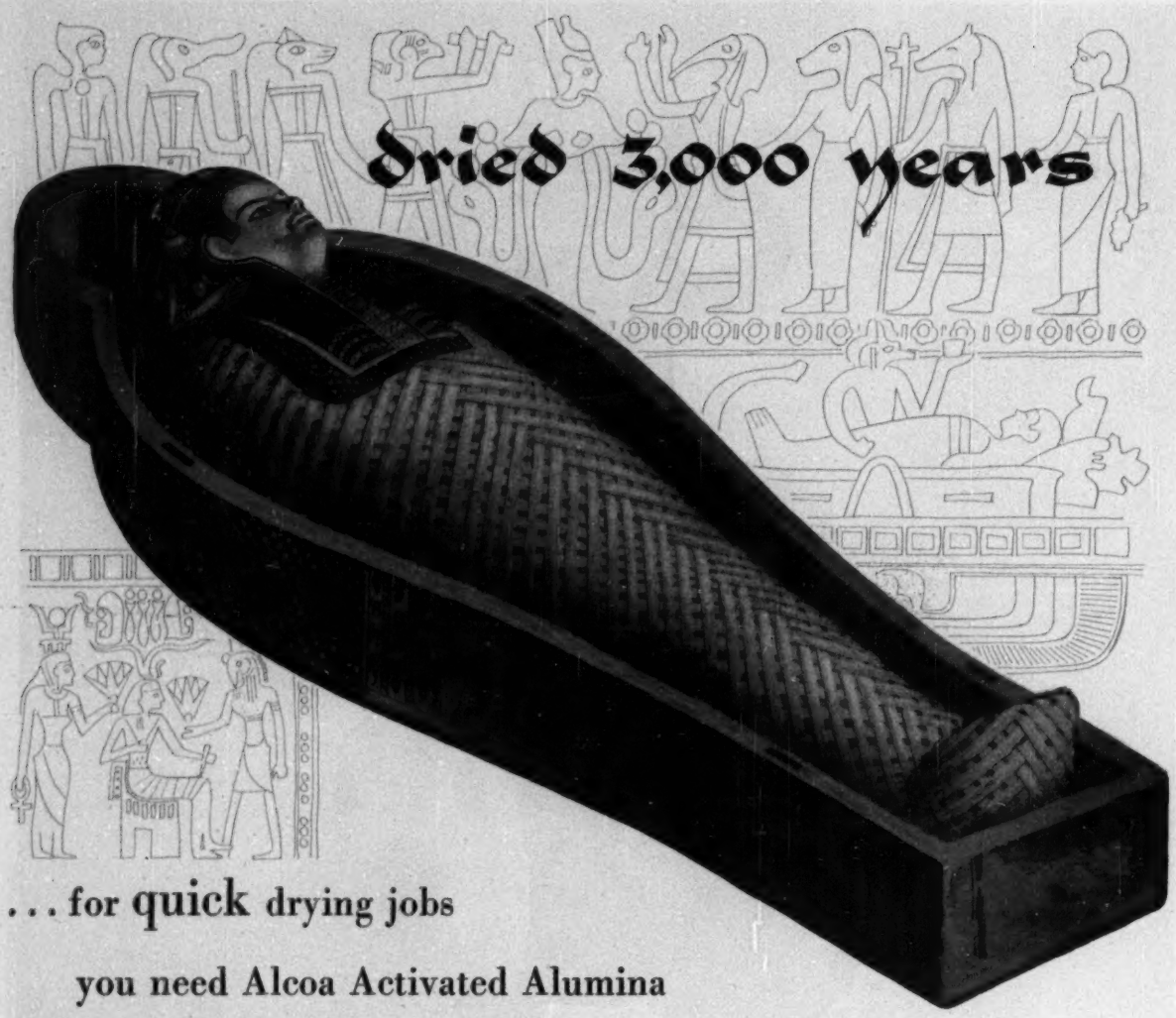
Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls


Powell Engineers always look to the future!
DEPENDABLE VALVES
SINCE 1846
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES



. . . for quick drying jobs

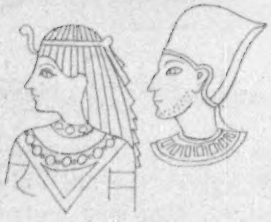
you need Alcoa Activated Alumina

If your business calls for quick, efficient dehydration of liquids, vapors or gases, you should be familiar with ALCOA *Activated* Alumina. It is one of the most effective desiccants you can buy. Dew points as low as *minus* 100° F.—and even lower—can be obtained, and under normal conditions, ALCOA *Activated* Alumina can be used for an almost indefinite number of drying cycles.

ALCOA *Activated* Alumina is a commercially pure, highly inert adsorbent with high resistance to crushing, shock and abrasion. It will not swell, soften or disintegrate even when immersed in water . . . is non-toxic . . . non-corrosive . . . practically iron-free. And its relatively low initial cost makes it extremely economical to use.

It is properties such as these that give ALCOA *Activated* Alumina its wide acceptance as an outstanding drying agent. Its desiccating properties are used in the chemical, food, candy, drug and petroleum industries, in air conditioning and for the maintenance of oils.

Perhaps dehydration with ALCOA *Activated* Alumina can simplify *your* processes, speed up *your* production, improve the quality of *your* product. It will pay you to investigate. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 702-B ALCOA Building, Pittsburgh 19, Pennsylvania.

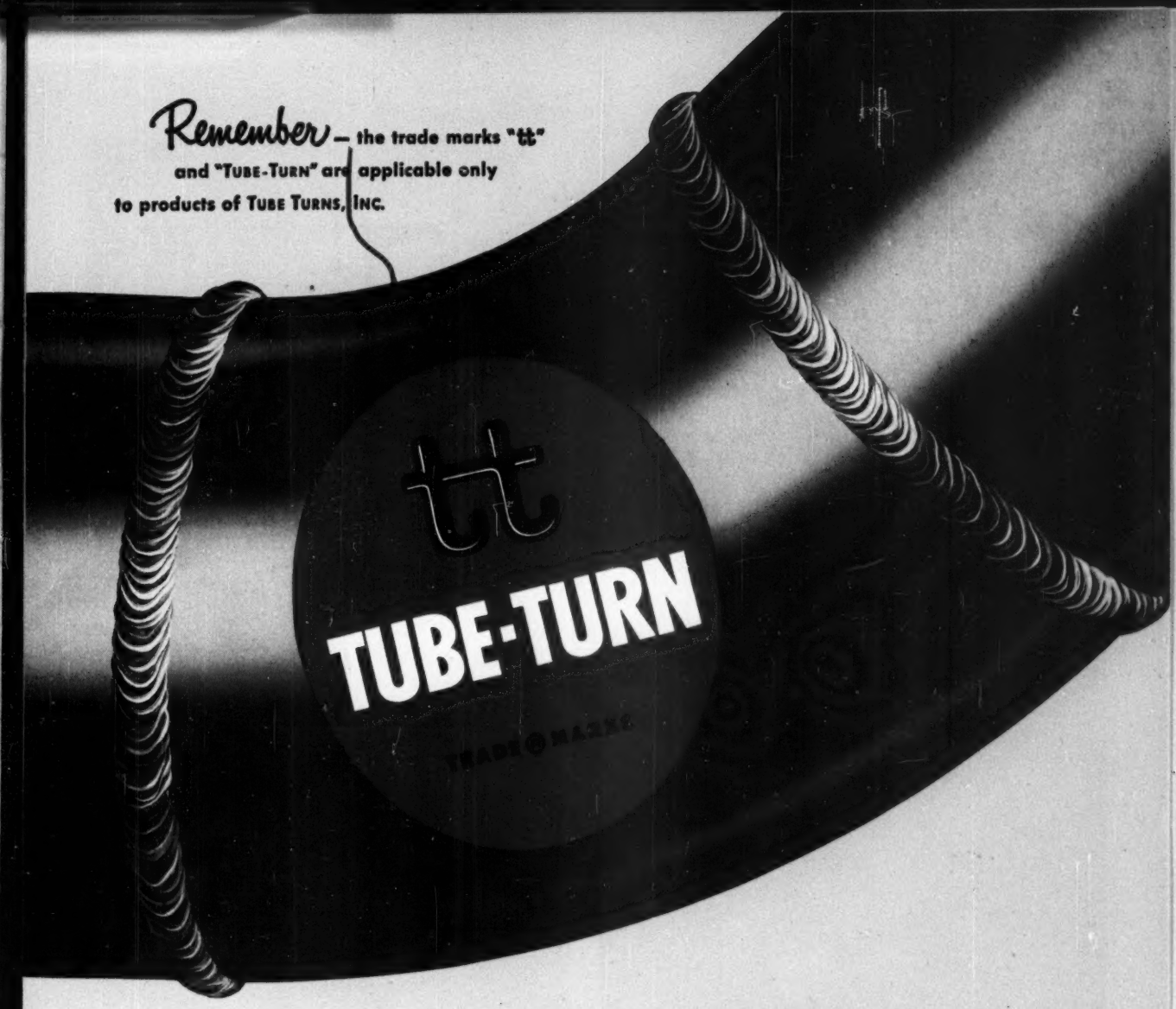


Alcoa Chemicals

ALCOA

ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM



Remember — the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Engineered FOR MINIMUM PRESSURE DROP

THIS TUBE-TURN Welding Elbow has full radius conforming to A.S.A. Standard B 16.9. The radius is not reduced by tangents. The interior walls are consistently smooth and perfectly circular . . . important production features which minimize pressure drop.

This attention to engineering detail pays off in your piping systems. When you specify TUBE-TURN Welding Fittings and Flanges, pressure drop is at a minimum and uniformity of fit-up is assured.

You'll find a TUBE TURNS' Distributor in every principal city. Call him for good service in good connections.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles

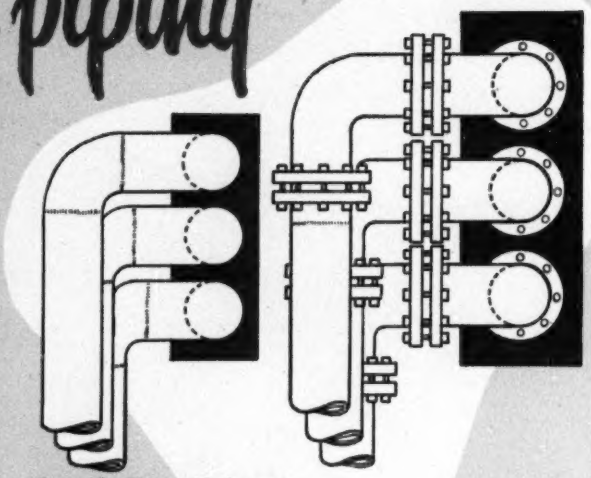
Wholly owned subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO

PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA. • KEROTEST MANUFACTURING COMPANY, PITTSBURGH, PA.

COMPACT *Welded piping* SIMPLIFIES THE JOB

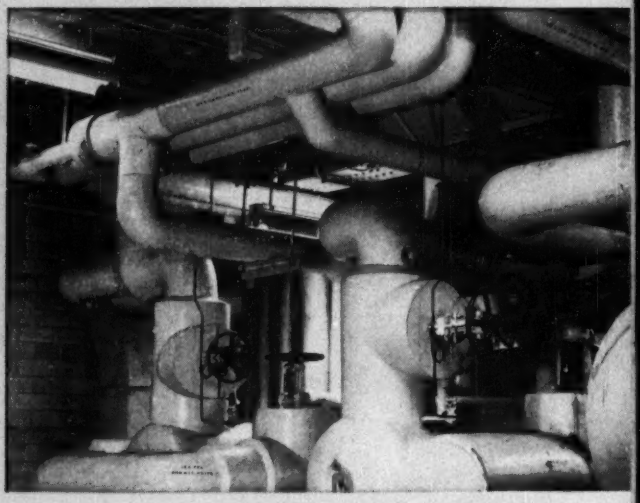
You can simplify design, save valuable space and speed up the piping job by specifying *welded construction* with Tube-Turn Welding Fittings. Welded joints are virtually flush with the pipe. Pipes can fit snugly together in tight corners . . . against wall or ceiling . . . or around equipment. And welded piping requires little elbow room to install . . . and to insulate. The true circularity and uniform wall thickness of Tube-Turn Welding Fittings simplifies fit-up and assures a job well done under crowded working conditions.

This is just one reason why it pays to specify *welded piping*. It's stronger, lighter, streamlined, economical to install, insulate and maintain.



Example: **The welded assembly on left takes a third less space than comparable flanged assembly.**

Bring on your tight corners! Entire sections of welded piping can be shop-fabricated and erected as a unit with a few simple tie in welds or flange connections to valves or containers.



In the new O. H. Hutchings Station of Dayton Power & Light Company. Piping for deaerators and feed water heaters is compact, streamlined and permanent. Directional changes are made with TUBE-TURN Welding Fittings.

Weld Dimension Data

Tube Turns, Inc. has compiled a handy folder of charts covering dimensions and weights of TUBE-TURN Welding Fittings and Flanges. If you'd like a free copy just send this coupon.

TUBE TURNS, INC., Dept. H-2
224 East Broadway, Louisville 1, Kentucky

Your name _____

Position _____

Company _____

Nature of business _____

Address _____

City _____ *State* _____

DISTRICT OFFICES

New York	Houston
Philadelphia	Tulsa
Pittsburgh	San Francisco
Chicago	Los Angeles

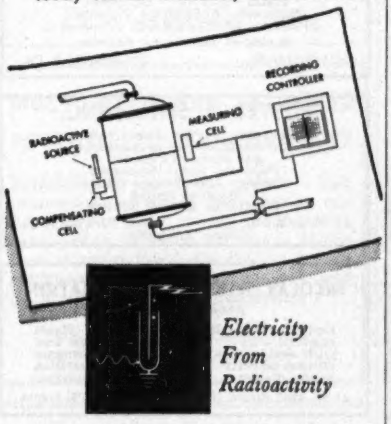
"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

see into steel tanks

New Ohmart Density Gauges "see" into steel vessels—simply and directly perform many "hard-to-do" measurement tasks with amazing accuracy! The penetration power of radioactivity is utilized to make *easy* many different evaluations of process variables, up to now difficult or impossible because of such conditions as extreme temperatures or pressures, or corrosive or erosive elements. A typical application is shown in the diagram below—where the Ohmart Density Gauge is used for liquid level measurement. Operation is simple—standard electronic instruments are used; equipment is sturdy and easily installed (usually with NO connections into the vessels themselves); only small, *safe* quantities of radioactivity are required. If you have any difficult process variables evaluation problem, where density is a function of the desired measurement, look to Ohmart Density Gauges for your solution. Write today for information, consultation.



Electricity From Radioactivity

the ohmart corp.

2337 FERGUSON ROAD
CINCINNATI 38, OHIO
DALLAS CHICAGO

R-M RESISTANT MATERIALS

SPECIALISTS IN ALL RESISTANT PIPING MATERIALS TO YOUR SPECIFICATIONS

STAINLESS
PIPE • FITTINGS
VALVES

WELDING • SCREWED • FLANGED

Schedules 5-10-40-80

COMPLETE STOCKS:

ALUMINUM-MONEL-NICKEL-EVERDUR
RUBBER-SARAN-PARIAN-USCOLITE

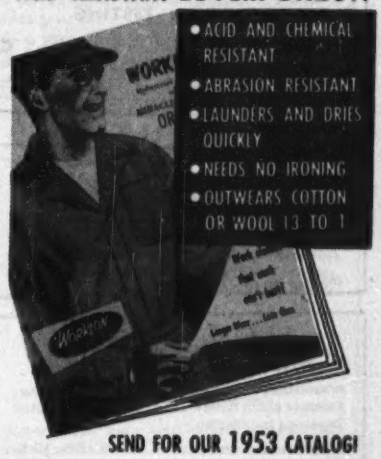
IMMEDIATE DELIVERY
FULL RANGE OF SIZES

RAY MILLER

254 NORTH 10th STREET, NEWARK 7, N. J.
4240 KANAWHA T'PK., SO. CHARLESTON, W. VA.
1210 HAYS STREET, HOUSTON, TEXAS

SAVE UP TO 80%
OF WORK CLOTHES COST!

WORKLON industrial apparel of ACID RESISTANT DU PONT ORLON



- ACID AND CHEMICAL RESISTANT
- ABRASION RESISTANT
- LAUNDERS AND DRIES QUICKLY
- NEEDS NO IRONING
- OUTWEARS COTTON OR WOOL 13 TO 1

SEND FOR OUR 1953 CATALOG!

WORKLON, INC. Dept. C-5 253 West 28th St., N. Y. 1
FREE! Rush WORKLON'S new and fully illustrated 16 page catalog of ORLON and COTTON WORK CLOTHES.
Firm Name.....
Address.....
City.....State.....
Attention of.....Dept.....

WHERE TO BUY

WEIGH MATERIALS WHILE CONVEYING
with the
MERRICK WEIGHTOMETER

MERRICK SCALE MFG. CO.
171 SUMMER ST., PASSAIC, N. J.

Magnolia

Manufacturers of

METAL POWDERS

FLAKE
CHIP
or
GRAIN FORM

MAGNA MANUFACTURING CO. INC.
Plant: - HASKELL, NEW JERSEY

SAUEREISEN
CORROSION-PROOF CEMENTS

offer complete resistance to both acids and alkalies in steel mills, chemical plants and processing industries. Send blue-prints or sketches, so we may recommend proper cement to use. Write for latest catalog.

TRIAL ORDER
FOR ACID AND ALKALI USERS
Handy quart cans for making comparative tests—8 different cements. **$7.50**

Sauereisen Cements Company Pittsburgh 15, Pa.

CHEMSTEEL CONSTRUCTION COMPANY, INC.
501 Chemsteel Bldg., Walnut St., Pittsburgh 37, Pa.

Send data on Engineering & Construction facilities for
ACID-ALKALI-PROOF CONSTRUCTION
of processing & storage tanks & flooring.

NAME.....
COMPANY.....
ADDRESS.....
CITY.....ZONE.....STATE.....

PROFESSIONAL SERVICES

PATENTS · PLANT DESIGNS · RESEARCH
REPORTS · INVESTIGATIONS · MANAGEMENT
TESTING · GENERAL CONSULTING · TRANSLATIONS
CHEMICAL AND BACTERIOLOGICAL ANALYSIS

R. S. ARIES & ASSOCIATES
Chemical Engineers & Economists
COMMERCIAL CHEMICAL DEVELOPMENT
Process Analysis • Market Research
Surveys—Technical and Economic
Design & Initial Operation of Complete Plants
Licensing of New Processes & Products
New Product Development
400 Madison Ave. EL-5-1430 New York 17, N. Y.

Consult these SPECIALISTS
Let them save your time by bringing their broad experience in their specialty to bear on your problems.

PATCHEN AND ZIMMERMAN ENGINEERS
Chemical, Process, and Industrial Plants
Investigations—Reports—Design—Supervision
Augusta, Ga. Atlanta, Ga. Anniston, Ala.

W. L. BADGER
CONSULTING CHEMICAL ENGINEER
Evaporation, crystallization, and Heat Transfer; Complete plants for salt and caustic soda; Complete Dowtherm installations.
300 South State Street Ann Arbor, Mich.

KNOWLES ASSOCIATES
Chemical—Metallurgical—Mechanical Engineers
Consultation — Design
Complete Plants — Equipment
Heavy Chemicals — Ore Dressing
19 Rector Street New York 6, New York
Bowling Green 9-3456

GUSTAVE T. REICH
Consulting Chemical Engineer
DEVELOPMENTS — OPERATION
CARBOHYDRATES INDUSTRY
BY-PRODUCTS
CARBON-DIOXIDE — WASTE DISPOSAL
Packard Building Philadelphia, Pa.

J. PAUL BISHOP AND ASSOCIATES
Consulting Food and Chemical Engineers
Specializing in:
Designing, Estimating and Engineering of New and Modernizing of Old Food and Chemical Plants and Processes.
Internationally Known
Write P.O. Box 348
Champaign Illinois

KOHN & PECHENICK
Consulting Chemical Engineers
Plants — Process — Equipment
DESIGN
Reports Trouble-Shooting Appraisals
262 Huron St. Brooklyn 22, N. Y.

SANDERSON & PORTER
Engineers and Constructors
New York • Chicago • San Francisco

CARL DEMRICK
Technical Translations
Send for Circular
88 So. Broadway Yonkers, N. Y.

THE KULJIAN CORPORATION
Consultants • Engineers • Constructors
Chemical • Industrial • Process
1200 N. Broad St. Phila. 21, Pa.
Offices Throughout the World

J. E. SIRRINE COMPANY
Engineers
Plant Design & Surveys covering Chemicals, Electrochemical and Metallurgical Production; Trade Waste Disposal; Water Supply & Treatment; Analyses & Reports.
Greenville - - - - - - - - - - South Carolina

RICHARD F. ENNIS, JR.
Consulting Chemical Engineer
Engineering and Economic Studies
Design—Development—Research
Lincoln-Liberty Bldg. Philadelphia 7, Pa.

MARCO COMPANY, INC.
Researchers—Machine Designers—Consultants
Specializing in the development of continuous processing methods and special equipment for chemicals, food and other products.
Third and Church Streets, Wilmington 40, Delaware

MARCUS SITTENFIELD
Consulting Chemical Engineer
Plants - DESIGN - Equipment
Economic - SURVEYS - Technical
Process - DEVELOPMENT - Product
Registered Professional Engineer
1411 Walnut St. Philadelphia 2, Pa.

EVANS RESEARCH AND DEVELOPMENT CORPORATION
Organic and Inorganic Chemistry Processes—Products
250 East 43rd St. New York 17, N. Y.

C. L. MANTELL
Consulting Chemical Engineer
Process Research and Engineering
Development
457 Washington Street New York 13, N. Y.

FOSTER D. SNELL, INC.
Laboratory & Pilot Plant Projects
On Manufacturing of Inorganic and Organic Chemicals.
Plant and Design Equipment
Complete Line of Spray Dryers
Inquiries Invited
Engineering Advisory Services
29 West 15th St. New York 11, N. Y.
Phone WA-4-5800

FRASER-BRACE ENGINEERING CO., INC.
Design Engineers & Constructors of
Hydro-Electric Developments
Metallurgical, Explosives, & Industrial Plants
Chemical & Process Industries
Railroads—Tunnels—Port Facilities
10 East 40th St., New York 16, N. Y. Lex 2-5870

MELVIN NORD, DR. ENG. SCI., LL.B.
Consultant in Legal and Technical Problems
REGISTERED PROFESSIONAL ENGINEER
CHEMICAL ENGINEER
PATENT ATTORNEY
604 Putnam Detroit 1, Mich.

NICOLAY TITLESTAD CORPORATION
Chemical Engineer
Design — Consultation — Complete Plants
sulphuric acid — phosphoric acid
nitric acid — oxidation of ammonia
nitrogen products — acid concentration
surplus dioxide — carbon bisulphate
11 W. 42nd Street, N. Y. 18 PE-6-0010

GEORGE H. KENDALL
Consulting Chemical Engineer
Cost Reduction Studies: Process or Product
Redesign Existing Products for Greater Profit.
Trouble Shooting Production, Design, Cost Problems.
Specialists Automatic Machinery, Processes, Controls
New Developments, Patent Studies, Investigations.
New Products & Process Engineering Studies
P. O. Box 3 (Est. 1923) Tel. Darien 5-1504
Norton Heights Darien, Connecticut

JAMES P. O'DONNELL
Engineer
CHEMICAL AND PETROLEUM PROCESS PLANTS
Design-Procurement-Construction Supervision
Start-Up
30 Broadway, New York 4

THE J. G. WHITE ENGINEERING CORPORATION
Design - Construction - Reports - Appraisals
80 Broad Street, New York 4

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

POSITION WANTED INDIVIDUAL SELLING OPORTUNITY undisplayed advertising rate is one-half of above rate, payable in advance. PROPOSALS, $1.20 a line an insertion.

INFORMATION

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

DISPLAYED RATE:

The advertising rate is $14.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page. C. E.

NEW ADVERTISEMENTS Address N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y., for March issue closing February 5th.

CHEMICAL IDEA MAN

•

to assist management in making policy decisions for product development and marketing. Ph.D. with polymer experience. Knowledge of chemical markets desired.

•

Send complete resume to

Box CE 1884

221 W. 41 St., New York 36, N. Y.

CHIEF ENGINEER

Old and successful manufacturer of special machinery for processing of chemicals seeks a CHIEF ENGINEER to direct design and product development. Chemical Engineering degree preferred. Salary $15-18,000. Good prospects.

P-6464, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

MULTI-WALL BAG SALESMAN

POTENTIAL DIVISION MANAGER

Established, growing paper bag manufacturer offers tremendous opportunity to man, strong on contacts, now selling in multi-wall field. Right man slated to head rapidly expanding multi-wall division. All replies will be handled in strict confidence.

SW-6559, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

Additional Positions Vacant Advertisements on the following page

---

CHEMICAL ENGINEERS

An active, confidential service! Interview at your convenience.
Call, write, or wire
GLADYS HUNTING (Consultant)
DRAKE PERSONNEL, INC.
7 W. Madison St. Chicago 2, Ill.

ENGINEERS — C.E., M.E., E.E.
1-5 years experience—To $800 month
Work for N. J.'s Top Firms
Come in for confidential interview or send 3 resumes for the best technical jobs.
SELECTIVE PLACEMENT
Employment Agency
17 William St. Newark 2, N. J.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

CHEMICAL ENGINEER. Ability to translate technical data into practical business and operating information. Involves expediting challenging research for converting residue products into fertilizers, building materials and chemicals. Headquarters San Francisco. Salary adjusted for minimum one-year contract. P-6425, Chemical Engineering.

CHEMICAL ENGINEER with Production Supervisory experience in the organic field, preferably with 3 to 5 years of experience in polymerization of vinyl chloride. To assume position as P.V.C. Plant Superintendent, reporting to organics production manager. Plant now nearing completion. Send summary of education, experience, etc., to Fred E. Gray, Personnel Manager, Diamond Alkali Co., P. O. Box 586, Pasadena, Texas.

RECENT PAPERMAKING or chemical engineering graduate with some technical experience in paper or paperboard desirable. Man selected will be responsible for product and process development work as a member of the technical staff in a progressive integrated midwestern board mill. Excellent advancement opportunities exist. In replying, give complete background of education and experience along with salary requirements. P-6456, Chemical Engineering.

WANTED: JUNIOR Instrument Engineer for design and application of pneumatic and electronic instruments to textile and chemical industry. Mechanical or Chemical Engineering or Physics degree necessary. Experience desirable. Location: Southwest Virginia. Celanese Corporation of America, Celco Plant, Narrows, Virginia.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 43 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection, under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

(Continued on the following page)

RESEARCH CHEMISTS, PHYSICISTS, ENGINEERS

The following additions to our permanent staff are needed for research on smokeless powder, rocket propellants, detonators, dynamites, and other explosive chemicals.

4 Chemists
3 Chemical Engineers
Physicist
Mechanical Engineer
Electrical Engineer

Experienced men particularly needed for responsible work: salaries commensurate. Staff positions also available for chemical or mechanical engineer in estimating cost of proposed research processes and in market studies; also research librarian.

Desirable insurance, retirement, holiday and vacation plans. Expanding diversified company makes advance possible to various fields. Submit detailed resume including salary requirement.

Employment Manager
OLIN INDUSTRIES, INC.
Explosives Division
East Alton, Illinois

DIRECTOR of RESEARCH

Successful manufacturer of ceramic products seeks a DIRECTOR OF RESEARCH. Should have Chemical or Chemical Engineering degree. Experience in ceramics valuable but not essential. Must have experience with bodies and glazes in glass or porcelain products. Salary and bonus $10-20,000.

P-6467, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

DIRECTOR of PHYSICAL & COLLOIDAL CHEMISTRY RESEARCH

A progressive research & development organization is seeking a physical chemist at PhD level to organize and direct a research program on investigations into surface physics, physics of thin films, colloidal chemistry, and related metallurgical problems. Requirements include 6-8 years experience in physical chemistry, colloidal chemistry, physical metallurgy and structure of matter (not sub-atomic). This position offers unusual opportunities for a man capable of organizing and directing this program. Excellent salary and associations. Send complete resume in confidence to

P-6419, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

SENIOR CHEMICAL ENGINEER

Experienced graduate chemical engineer required for large research and development organisation in Northern Rhodesia. Duties relate to process metallurgy of copper, cobalt, lead, zinc and other base metals. Applicant must have minimum 5 years industrial experience. Total remuneration approximately £2,400 per annum comprising basic salary, variable metal bonus, and cost of living allowance. Generous pension and leave privileges. Applications stating age, marital status, qualifications, experience record, availability, and accompanied by a recent photograph should be addressed to The Secretary, P. O. Box 172, Kitwe, Northern Rhodesia.

RESEARCH DIRECTOR

Manufacturer of special processing equipment seeks RESEARCH DIRECTOR. Must have Ph.D. degree in Physical Chemistry or Chemical Engineering. Salary about $20,000.

P-6461, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

ENGINEERING DRAFTSMAN AND DESIGNERS

Experienced in Plant Layout. Process Piping, Power and Lighting Layouts, Structural Steel and Reinforced Concrete Design.

Submit Complete Resume — Education, Experience and salary expected.

Solvay Process Division
ALLIED CHEMICAL & DYE CORP.
Syracuse 1, N. Y.

RESEARCH DIRECTOR and RESEARCH CHEMIST

needed for rapidly growing Southern California vinyl plastic company with national distribution. Should be experienced in plastisol and hot melt fields

Give full particulars in letter—age, experience, education, references, personal history, salaries received, salary expected, and comments on willingness to move to California. Reply:

Box 2393 Terminal Annex
Los Angeles 54, California

CHEMICAL PLANT WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies

"Confidential" C. J. GALI, Sec.
233 Broadway, N. Y. 7, N. Y. BA 7-1810

(Continued from preceding page)

POSITIONS WANTED

EXPERIENCED PROCESS equipment designer with background of 5 years in sales and application of process equipment and 6 years in design. Currently employed as design engineer but interested in representing manufacturer of process equipment to the chemical processing industries. Can help in handling customer's design and application problems. Willing to relocate in Middlewest, preferably in vicinity of Chicago. PW-6527, Chemical Engineering.

QUALIFIED CHEMICAL engineer desires change of job by February first if possible. Have extensive technical knowledge and enough leadership to handle plant personnel. Most experience in production but have worked in maintenance, construction, developing and engineering. If your plant needs someone to make processes run smoothly and profitably how about giving me a chance? Age 42, now located in New Jersey. PW-6353, Chemical Engineering.

SELLING OPPORTUNITIES WANTED

ENGINEERING SALES organization with established following in Texas and Louisiana chemical and refining industries desires additional equipment, construction material, or maintenance line. Registered Professional Engineers. RA-6264, Chemical Engineering.

MANUFACTURERS' AGENT now handling prominent manufacturer's crushing, grinding, separating and mixing equipment. Desirous of expanding with allied or related line serving the chemical process industries in all or part of Atlantic seaboard. RA-6164, Chemical Engineering.

SALES ENGINEERING organization with established following in chemical, Pharmaceutical and allied industries, desires to represent additional processing equipment manufacturers in New York, New Jersey, Delaware and Pennsylvania. Commission only. RA-4453, Chemical Engineering.

TECHNICAL SALES — Chemical Engineer, B.Ch. E., Age 28, single, 6 years industrial experience, paints, lacquers, solvents, pharmaceuticals, explosives, allied chemicals. Desires to represent process equipment or chemical manufacturer in N.Y., N.J. and Conn. areas. RA-6483, Chemical Engineering.

AVAILABLE CUSTOM REFINING FACILITIES
- Distillation • Extractions
- Separation • Fractionations
- Drum Lots—Tank Cars

WANTED
- All Types of Crude Mixtures
- By-Products, Residues, Wastes
- Contaminated Solvents

TRULAND CHEMICAL & ENGINEERING CO., INC.

Box 426, Union, N. J. UNionville 2-7360

ANXIOUS TO BUY

Plants for Liquidation Purposes

Any type - any size - any location

Write, wire or phone your offerings to the

WEINSTEIN CO.
Division of Surplus & Salvage Co., Inc.
P. O. Box 804—Jamestown, N. Y.

WANTED

Vacuum Dryers, Heavy Duty Mixers, Reactors, Kettles, Columns, Rotary Filter, Pulverizers, Filter Presses, S/S and non-corrosive Tankage. Idle or Set Up Plant.

P. O. BOX 1351
Church St. Sta. New York 8, N. Y.

NEW DISTILLATION COLUMN

4' x 37' capacity 540 gal. per hour of acetone. Can be used for any liquids. Has 21 trays w/bubble caps; plans & photos avail. NO REASONABLE OFFER REFUSED.

MILTON ROY NEW PROPORTIONATE PUMPS

(2 avail); 1—Model #135-38; w/GE ac explosion motors; sulphuric acid; 1—Type #316 stainless steel; 500 & 34 gal. per hour; ECONOMY 2 STAGE PUMPS, all in very good condition. . . . OPEN TO OFFERS.

FISHER VALVES (5) w/air-o-matic motors. 2-½", 3", & 4" Brown Instruments attached.

BUTLER CAR SCOOP

Mod. #105378H; 2' x 3' scoop; serial #15905; 1¼ yard capacity/w/Waukesha engine. Ideal for carrying chemicals. In good condition $300.00

EVEREADY, 805 Housatonic Ave., Bridgeport, Conn.
4-9471

FOR SALE

LARGE REFRIGERATION EQUIPMENT

For air-conditioning or industrial use.

Used 2 short summers, then cleaned and preserved. Available immediately at great saving.

2 UNITS MANUFACTURED BY YORK, EACH CONSISTING OF

1 centrifugal compressor, 1 water cooler, 1 condenser, 1 synchronous motor 2000 HP, 1 speed increaser, control equipment.

FREELAND PRODUCTS COMPANY
700 Dryades Street New Orleans 12, La.
TU 6381 TU 5361

FILTERS

Two Refinite DF-2 units with Aloxite Carborundum elements. Capacity each unit, 80 gpm., with diatomaceous filter powder. Used only short time. Sell for half new price.

RIPLEY'S INC.
TOPEKA, KANSAS

FOR SALE
MODEL 841 SANITARY
CHERRY BURRELL VISCOLIZER
Stainless Cylinder block 800 G.P.H. 3000 P.S.
1—30 HP Motor. Price $2500.00
PACIFIC PROCESSING CORP.
TERMINAL ISLAND, CALIF.

FOR SALE

One New 40 inch Bird Suspended Heavy-Duty, Bottom discharge Centrifugal
1800/900 RPM, with Imperforate, Solid Stainless Steel Basket, equipped with 40/10 HP Motor, V-Belt Drive.

FS-6321, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

Corrosion Resistance Drums

*BUY * SELL*

Specializing in Polyethylene and Baked Linings For All Purposes in Drums or Tanks

EDWARDS STEEL DRUM
350 Rider, Bronx, N.Y.C. Mott Haven 9-4870

READY TO BUY

Dyes - Chemicals - Pigments - Waxes
Plasticizers - Solvents - Colors
By-Products - Wastes - Equipment

CHEMICAL SERVICE CORP.
80-04 Beaver St. New York 5, N. Y.

HOW TO SAVE IN 1953

Buy From

"CONSOLIDATED"

36 YEARS AGO

"Americans can never establish a great Chemical Industry. They lack science and technology. Their defeat in this war is inevitable" wrote the German Consul-General Hossenfelder in New York, in 1917. But American Chemical Engineering achievements won that war, and laid the foundation for what is today the largest and most resourceful chemical industry in the world.

"CONSOLIATED"

SERVING THIS INDUSTRY SINCE 1917

SPECIALLY PRICED

5—Devine #28 Vacuum Shelf Dryers, each 20 shelves 59" x 78", surface condensers and vacuum pumps.
2—Ball & Jewell #2 Rotary Cutters.
1—Tolhurst 48" steel basket Centrifugal, susp. type, bottom discharge.
4—Traylor Tube Mills, 5' x 22', 5' x 20', 4'6" x 18'6", 4' x 13', each stone-lined, scoop feed, peeble charge, clutch pulley.

Still installed in one plant as operated, with all accessories as used.

ROTARY KILNS & DRYERS

4—7'x60' Calciners, made by Struthers Wells. Each 9/16" shell, Timken roller bearing supports, F-B gear reducer, with V-belted AC motor, firing hood, seal ring, all in excellent condition and priced for quick action.
2—Vulcan Iron Works 6'x60', complete, each with 3'x30' Rotary Cooler.
1—7'6"x125'; 1—8'x135' Allis Chalmers Rotary Kilns.
1—4'6"x55' Calciner, by Ruggles-Coles Co, complete.
4—Ruggles-Coles Direct Heat Rotary Dryers—Class XF4—54"x25', 1 Class XF 5'x40'. Also L-B 2'7"x10' Roto Louvre; three 3'x50'; 5'x30'; 5'x50'; 6'x40'; 6'x60'; 7'x70'.
1—8'x54' Direct Heat Rotary Dryer; Struthers Wells Co, with Timken roller bearing support, L-B gear reducer, 40 hp. motor, Coen burner, etc.
3—6'x50' Louisville Rotary Steam Tube.
1—4'x66 Flaker or Cooling Roll.
1—5'x33' Rotary Vacuum Dryer, jacketed shell; 1—20"x8', jacketed, with dust collector and condenser.

FILTER EQUIPMENT

2—#12 Sweetland Filters for 36 leaves on 4" c.c.
10—Shriver 42"x42", Iron Filter Presses, Plate & Frame, 18, 27, 36, 54 chambers, 1" cake.
16—Sperry 18'x18', Iron, P & F, Filter Presses, closed delivery, 11 chambers.
1—American Disc Filter 6' dia., 2 disc, 100 sq. ft. filtering area, with auxiliaries.
1—Shriver, iron, steam heated, 30"x30", 20 chambers, 1" cake.
1—8'x12' Oliver Lead-Wood Vacuum Filter Acid-Resisting.
3—Oliver Vacuum Filters, incl. 8x112', 11'6"x14', 11'6"x18'.
1—ALUMINUM Sperry FILTER PRESS, 30 x300"; 45 chambers, 1" cake.
1—Sperry 24"x24" P & F Filter Press with 25 chambers, 2" frames.
1—#7 Sweetland Filter with 20 steel leaves, 4" c.c., NEW 1951.

NEW STAINLESS STEEL FABRICATION

We have available excellent facilities for fabricating Stainless Steel Tanks, Kettles, Condensers, Reactors, Autoclaves, Distillation Columns, Filter Presses, Heat Exchangers, etc.
ASME Code Construction
Will gladly furnish estimates to your specifications.

DRY POWDER MIXERS

1—Kilby jacketed Horiz. Ribbon Mixer, 450 cu. ft. capacity.
1—Day Size F, 1850#; 1—Howes 1,800# dbl. ribbon; 1—Munson Rotary 1,000# batch; 1—Day 400#.

EVAPORATORS

1—Quadruple Effect Evaporator, calandria type, brass tubes, 14,000 sq. ft H.S.; excellent condition; still erected; complete with piping, etc.
4—Mojonnier S/S Vac. Pans, 3', 4', 5', 6'.

VIBRATING SCREENS

1—Tyler Hummer 4'x10', 2 deck, with 2 vibrators.
1—Battery of two 3'x5" Tyler Hummer, Type 33, with Generator Set for both.
1—3'x8' Selectro, single deck.
1—3'x6' Selectro, single deck.
1—3'x6' Selectro, double deck—rebuilt.
1—18"x5' Selectro—rebuilt.
1—Day S/S single deck, 40"x84".
1—Tyler "Rotap" Testing Screen.

PULVERIZERS

1—#5057 Raymond 5-roll, high side, with oil jornals. Complete.
1—4'6x7" Ball Mill, Allis Chalmers, iron lined. Used 100 hours.
3—Mikro Pulverizers, 2SI, 4TH.
1—6"x15" Sturtevant Jaw Crusher, to ½".
1—24"x15" Sturtevant Crushing Rolls, balanced type.

HIGH SPEED MILLS

8—J. H. Day type B, 14" x 30", 3 roll High Speed Roller Mills, with all roller bearings and watercooled rolls —silent chain drive.

PEBBLE MILLS

All porcelain lined

3—5' x 4', 235 gal.
2—6' x 8', 800 gal., porcelain and burrstone lined.
1—Abbe #4 porcelain lined, 125 gal., 45" x 42".
1—Patterson 24 x 36", 25 gal.

JACKETED KETTLES

2—500 gal. steel jacketed closed agitated Vacuum Reactors.
1—Stainless Lee 300 gal. Style A.
6—Dopp C.I. 80, 100, 150, 350, 600 gal.
7—Steel, agitated, 350, 500, 700, 800.
3—9500 gal., welded, agitated, open.
29—Aluminum and Copper, 30 gal. to 800 gal., some agitated.

DOUBLE DRUM DRYERS

1—42" x 120" Buflovak Atmospheric S/S Conveyors, S/S Elevator, S/S Hood.
4—5' x 12' Buflovak Atmospheric.
2—32" x 90" Buflovak Atmospheric.
1—32" x 72" Buflovak Atmospheric.

MISCELLANEOUS

1—42" Stainless Steel A.T.&M. Co. Centrifugal, 40 H.P. Motor.
1—Tolhurst 40" monel Centrifugal.
1—13,500 gal. Stainless Steel Tank closed, agitated, S/S coils, m.d.
2—Buflovak 8' dia. Vacuum Crystallizers; 1—6' dia. Atmospheric, jacketed.
1—6'x14' Hardinge Rotary Counter Current Classifier, also for dewatering or scrubbing.
2—Dorr two-stage Classifiers, each with two rakes, total length 27', gear reducer and motor.
1—Davenport #3A Dewaterer, with speed reducer and 5 HP AC motor.
1—Mechanical Cooker, 5' dia. x 16 long, jacketed, agitated, Insur. Certificate.
1—20 gal. jacketed, dbl sigma bladed Baker Perkins Mixer, m.d.

IDLE MACHINERY
WE BUY FOR CASH
SEND LIST

CONSOLIDATED PRODUCTS CO., INC.

LARGEST AND OLDEST DEALER IN REBUILT PROCESSING EQUIPMENT

2015 PARK ROW BLDG., NEW YORK 38, N. Y., BArclay 7-0600, Cable Address: EQUIPMENT, N. Y.

Modern Rebuilt Equipment At Great Savings

UNION Rebuilt Machinery Established 1912

International Stainless Steel Straightline Vacuum Filler, 160 per minute.

Resina LC Automatic Capper.

Pneumatic and Tite-Cap Auto. Cappers.

Fitzpatrick S.S. Jacketed Comminuter.

CRCO New Way MH Wraparound Labeler.

S. & S. G1, G2 and G6 Auger Fillers.

Stokes and Smith HG88 Duplex Auger Powder Filler.

Colton 2, 3RP Rotary Tablet Machines.

Stokes 2C Cream Filler and Closer.

Triangle Elec-Tri-Pak G2C, A6CA Fillers.

Filler 4-Head Stainless Steel Filler.

2000 gal. and 500 gal. Jacketed Mixing Tanks.

Horix S.S. 14-Head Rotary Filler.

Standard Knapp No. 429 Carton Sealer.

Mikro 4TH, 3TH, 2TH, 1SH and Bantam Pulverizers; Schutz O'Neill Mills.

Tri-Homo #5 Colloid Mill, 7½ HP.

3500 gal. working cap. Steam Jacketed, Double Arm Mixing Tanks for mixing, storing or processing of your materials.

Day 650 gal. Steam Jacketed Mixer.

B.P. 150 gal. Unidor S.J.D.A. Mixer.

Stokes, Day, New Era, Hottman Mixers, from 2 to 450 gal., with and without Jackets, Single, Double Arm Agitators.

Baker Perkins and Readco Heavy Duty 5 to 150 gals. Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

Ross, Day, Pony Mixers, 8, 15 gal. caps.

Day 100, 800, 1500, 2500 lbs. Dry Powder Mixers and Sifters.

Lee 85 gal. S.S. Jacketed Mixing Kettle.

Pony M. ML Labelrites; World Rotary and Straightaway Labeler.

Pneumatic Scale Cartoning Line, 60 and 30 per minute.

Oliver Cellophane Adjustable Wrapper.

Miller, Scandia, Hayssen, Wrappers.

Hudson Sharp Campbell high-speed automatic cellophone Wrapper.

Package Machy. Co. FA4, FA Wrappers.

Over 5000 Machines in Stock—Immediate Deliveries
Further Details and Quotations Available On Request

Immediate Deliveries

UNION STANDARD EQUIPMENT CO.
318-322 Lafayette Street New York 12, N. Y.

The Right Quality... *The Right Price*

★Rebuilders for 25 years. Your logical source for processing equipment.

PARTIAL LIST—Send for complete listing

COMPLETE CRUSHING AND SCREENING PLANT
Crushers: Roll, Allis-Chalmers 36x16", 24x14".
Crusher: Jaw, Universal 9"x36".
Screens: 2—Tyler-Hummer 4'x10'.
Screen: 1—Rotex 40"x84".
Elevators, Blowers, Trough Conveyors, Motors, Steel Bins and Miscellaneous Items.

1—30" Tolhurst imperforate basket suspended Centrifugal.
1—250 gal. working capacity Readco stainless steel, double arm sigma blade Mixer with 50 hp. M.D.
1—12 x 24" Farrell-Birmingham 2-roll Rubber Mill with 25 hp. drive.
5—3000 gal. Pfaudler jacketed glass lined (dairy) vertical Tanks.
50—Stainless steel Tanks (New and Used) up to 1000 gallons.
30—S.S. steam jacketed Kettles (new and used) up to 150 gallons.
1—20 gal. Stokes S.S. Vacuum Pan.
1—Day 3000 lb. jacketed Powder Mixer.
12—Filter Presses — recessed and plate and frame—from 7" to 30".
5—Day 12 x 32" 3-roll Mills.
3—Double drum Atmospheric Dryers — 42 x 120", 32 x 90", 24x80".
6—8' x 40' Rotary Hot Air Dryers.
8—Dry Powder Mixers—100 to 3000 lb. cap.
1—New Premier 3" stainless steel Colloid Mill with 7½ hp. motor.
1—Charlotte M-15 stainless steel Colloid Mill with 15 hp. motor.
3—Clarifiers — Sharples airtight, stain. steel, 3 hp.
2—Steel Tanks—2000 gal. heavy duty steam jacketed, open top.
2—De Laval 54-81 motor driven Clarifiers.
6—Agitators: Nettco WT-27, stain. steel turbine type.
1—Disintegrator: Riets-46 hp.
1—Evaporator: New stain. steel, 3000 lb. per hr. evaporation.
1—Vacuum Pan: 28" mojonnier stain. steel.
1—Oliver Filter 3' x 4', Everdur construction.
1—Davenport Rotary Press, #3A, Durimet #20 screen plates.
1—Day Roball Screen 40" x 84", single deck.
1—Ball & Jewel #2 ball bearing Rotary Cutter.
1—Nash Hytor Pump H5, 20 hp.

WE BUY • WE SELL
Single items
"IT PAYS — TO TRADE — WITH LOEB"
Complete Plants
Phone BRunswick 8-5326

LOEB EQUIPMENT SUPPLY CO.
1917 WEST NORTH AVE. CHICAGO 22

RENTAL OR SALE
EXISTING
BOILERS
10 TO 5000 HP — 10 TO 900 PSI
DIESEL ENGINES — STEAM TURBINE
GENERATORS
5 TO 20,000 KW
DEAN G. STRICKLER & ASSOCIATES
5220 Pennington Ave. Baltimore 26, Md. Cypress 4434
1346 Conn. Ave. Washington 6, D. C. Dupont 7-3386

OVERHEAD ELECTRIC TRAVELING CRANES: 2—Shepard Niles 7½ ton, 80' span, 4 motor, bucket operating, cage control, 440 volt, A.C., with or without 2½ yd. clam shell bucket. Now operating, one available now, one in February 1953, excellent condition.

LOCOMOTIVE CRANE: Link Belt 25 ton, std. R.R. gauge, gasoline powered, air brakes, cast steel trucks, bucket handling, with 1¼ yd. clam shell thoroughly modern, excellent condition. For Sale or Rent. Located Minnesota.

KILNS: 1—7' x 120 ft. and 2—8' x 125 ft., complete with all equipment including Fuller grate type coolers.

AIR SEPARATORS: One Bradley and one Sturtevant 16 ft. with or without 100 H.P., 440 volt, motor.

A. J. O'NEILL
Lansdowne, Pa.
Phila. Phones: MAdison 3-8300—3-8301

QUIT HORSING AROUND - - - PICK GELB FOR TOP VALUE

- 1—Bird 24" Monel Screen Type Centrifugal Filter.
- 1—Feinc Stainless Steel Rotary Vacuum Filter, 3' x 3'.
- 1—Oliver Homogenous Lead Filter, 8' x 8'.
- 4—Sperry Stainless Steel Filter Presses, 12" x 12", Closed Delivery, 10 Chambers Each.
- 1—Shriver Stainless Steel Filter Press, 24" x 24", Closed Delivery, 10 Chambers.
- 1—Sperry Aluminum Plate & Frame Filter Press, 42" x 42", Closed Delivery, 3" Frames, 35 Chambers.

THE GELB GIRLS FEBRUARY 1953

DRYERS—KILNS

1—Buflovak Stainless Steel Lab. Double Drum Dryer, 6"x8".
1—Ruggles Cole Rotary Dryer, 7½'x60'.
1—Vulcan Rotary Kiln, 7'x120'.
4—Devine, Stokes & Buflovak Vacuum Shelf Dryers, 5, 9, & 12 Shelves.
2—Buflovak Double Drum Dryers, 32"x90" & 42"x120".
1—Louisville Rotary Steam Tube Dryer, 6'x50'.
1—Huhn Rotary Steam Tube Dryer, 3'x12'.
2—Buflovak Vacuum Drum Dryers, 24"x20".
1—J. P. Devine Rotary Vacuum Dryer, 5'x25'.
2—Buflovak Double Door Vacuum Shelf Dryers, 20 shelves each.
1—Buflovak Stainless Steel Rotary Vacuum Dryer, 3'x15'.

FILTERS

3—Shriver 24"x24" Aluminum Plate & Frame Filter Presses, Closed Delivery, 35 Chambers each.
1—Sperry 42"x42" Cast Iron Plate & Frame Filter Press, 16 Chambers, Closed Delivery.
1—Sperry 12" Bronze Plate & Frame Filter Press, Closed Delivery, 9 Chambers.
1—Shriver 42"x42" Evedur (Bronze) Plate & Frame Filter Press, 40 Chambers. Closed Delivery.
1—Shriver 36"x36" Cast Iron Plate & Frame Filter Press, Steam Jacketed, 48 Chambers, Closed Delivery.
3—Shriver 36"x36" Cast Iron Plate & Frame Filter Presses, Closed Delivery, 24 & 25 Chambers.
5—Sweetland Filters, #2, 5, 7 and 12.
2—Oliver Rotary Vacuum Filters, 5'3"x6', steel construction with monel screens.
1—Oliver Rotary Steel Filter 3'x1'.
2—Shriver 24"x24" cast iron, closed delivery, filter presses, 3 eye, 23 chambers each.

CENTRIFUGALS

2—Tolhurst Rubber Covered Centrifuges, 14" & 26".
2—A. T. & M. Stainless Steel Suspended Type Centrifuges, 48" Imperforated Baskets with motors.
1—A. T. & M. Stainless Steel Suspended Type Centrifuge, 54" Imperforated Basket with motors.
2—Fletcher 40" Whirlwind Centrifuges, Bronze Perforated Basket with Explosion Proof Motors.
1—Tolhurst Stainless Steel Suspended Type Centrifuge, 40" Imperforated Basket.
1—Fletcher 48" Whirlwind Centrifuge, Bronze Perforated Basket with Explosion Proof Motor.
1—Tolhurst Center Slung Centrifuge, 36" Perforated Steel Basket with Explosion Proof Motor.
1—Sharples Stainless Steel Super D Canter, Model PN-14.
6—Sharples #16-Y Stainless Steel Super Clarifying Centrifuges.

MIXERS

2—Baker Perkins Jacketed Lab. Mixers, Size 4, Stainless Steel & Steel Construction, Sigma Blades.
1—Lightnin' Mixer, Model SAG 1000, 10 HP Explosion Proof Motor.
1—Nettco Drive, Model WT 27, output speed 16.
1—Banbury Mixer #1.
1—Simpson #1 Intensive Mixer.
4—Baker Perkins Steel Jacketed Mixers, Sigma Blades, 100 Gals.
3—Baker Perkins Stainless Steel Jacketed Mixers, Sigma Blades, 100 Gals.
1—J. H. Day Jacketed Powder Mixer, 5000 lbs. Center Discharge.
3—Turbo Steel Jack. Mixers, 700 Gals. Each.
1—Banbury Size B Laboratory Mixer with Motor & Reducer.
12—Simpson #0 Intensive Mixers "Unused".
1—Readco Stainless Steel Jacketed Double Arm Jacketed Mixer, Sigma Blades, 225 Gals.
1—Baker Perkins Stainless Steel Dispersion Mixer, Size 15, Type VUMM, 100 gals. working cap., 150 gals. total cap., 75 HP Drive.

PULVERIZERS—GRINDERS—MILLS

1—Mikro #3TH Mikro Pulverizer with 30 HP Motor.
1—Mikro #3W Pulverizer.
1—Mikro #2TH Pulverizer, Stainless Steel & Bronze Construction, with Motor.
1—Abbe #2 Master Rotary Cutter.
1—Ball & Jewell #0 S.S. Rotary Cutter.
2—Ball & Jewell #2 Rotary Cutters.
1—Blaw Knox Air Mill Pulverizer.
1—Mikro Stainless Steel Atomizer #6.
3—Thropp 2-Roll Rubber Mills, 18"x50".
1—Abbe #2 Buhrstone lined Pebble Mill, 5'x4'.
1—Gruendler #24-40 Hammer Mill.
1—Thropp 2-Roll Rubber Mill, 10"x24".

AUTOCLAVES—KETTLES—TANKS

1—Adamson Steel Vulcanizer 6'x20'.
2—Blaw Knox Steel Jacketed Autoclaves, 300 & 500 Gals. Cap., Working Pressure 500 Lbs.
1—Patterson Stainless Steel Autoclave, 225 gals. cap with stainless steel turbo agitator, 225 PSI internal pressure.
1—Glascote glass lined jack. vac. reactor, 1600 gals. cap. (Unused).

- 1—Alco Stainless Steel Heat Exchanger, 60 sq. ft.
- 3—Downington Stainless Steel Heat Exchangers, 45 & 500 sq. ft.
- 1—Struthers Wells Hastelloy B Heat Exchanger, 450 sq. ft. Unused.
- 1—Swenson Walker, Type 316 Stainless Steel Jacketed Crystallizer, 4-10" Sections.
- 1—Buflovak Type VRC Double Effect Monel Evaporator, 250 sq. ft.

1—Combustion Engineer Stainless Steel Jacketed autoclave, 500 gal. cap., 300 PSI internal pressure.
1—Patterson Steel Jacketed Autoclave, 900 Gals. Cap., Internal Pressure 120 Lbs.
1—Stainless Steel High Pressure Autoclave, 10 Gals. Cap., 250 Lbs. Internal Pressure.
1—Pfaudler Glass Lined Jacketed Vacuum Reactor, 500 Gals. Cap.
1—Pfaudler Glass Lined Jacketed Kettle with Anchor Type Agitator, 150 Gals.
12—Koven Stainless Steel Jacketed Vacuum Kettles, 380 Gals. Cap.
1—Koven S. S. Storage Tank, 1200 Gals. Cap.
1—Koven Steel Mixing Tank, 1200 Gals. Cap. with Nettco Drive, 10 HP Explosion Proof Motor, Turbin Agitator.
1—Artesian Steel Jacketed Kettle, 1,000 Gals. Cap., with Rake Type Agitator, ASME Code, 50 Lbs. Pressure.
2—J. P. Devine Jacketed Vacuum Reactors, 2,000 Gals. Cap. Each.
2—Buffalo Steel Pressure Tanks, 1,000 & 10,000 Gals. Cap., 100 & 125 PSI, ASME Coded.
2—Steel Storage Tanks, 6,700 Gals. Cap. Each, 80 PSI.
10—Steel Fermenting Tanks, 1300 Gals. Each with Coils & Agitators, 80 PSI.
25—Steel Storage Tanks, 9,000-17,500 Gals.
1—Steel Rubber Lined Storage Tank, 4,500 Gals. Cap.

MISCELLANEOUS

3—Vulcan all Copper Condensers, 300 & 350 sq. ft.
1—Dayton Dowd Centrifugal Pump, Stainless Steel, Size 1C3, 35 GPM at 40' head, speed 1745 RPM, 2"x1".
1—Worthington Worthite Pump, with 7½ HP Motor.
2—Worthington Antaciron Centrifugal Pumps, Model #3 CU1, 4"x3".

Established 1886

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

STATE HIGHWAY No. 29, UNION, N. J. • UNionville 2-4900

QUALITY EQUIPMENT

IMMEDIATELY AVAILABLE

AUTOCLAVES
2000 gal., 200 PSI. (3)

CENTRIFUGES
Bird, 24" type CH, SS.
Fletcher, 40" type 304 SS.
Tolhurst, 40" perforated.

COLUMNS
8'x36'x⅜" (2—NEW).
6'x29', type 347 SS, 21 trays.
6'x49'x⅜", 19 trays.
24"x94"x⅛", rubber lined.

DIGESTERS
3900 gal., jack'td. agit., ASME 75 PSI.

DRYERS
Conveyor, 24"x28' cc.
Drum, 5'x6'.
Vacuum, Stokes Model 59AB.

FILTERS
12"x12" Aluminum, 10 chambers.
36"x36" Shriver, 36 chambers.
8'x10', & 11'6"x18'—Oliver.
#7 Sweetland, 41 taps.

KILNS—COOLERS—DRYERS
4'x35'x½" welded.
502-20 Roto-Louvre.
5'x30'x⅜" Ruggles Cole.
5'x67'x5/16".
7'x60'x⅜".
7'x120'x⅜" (2).
10'x90'x9/16".
(Many others in stock. Send us your requirements.)

MILLS
6'x8' Ball, Abbe, Style GPH (3).
2'x12' L. B. double shaft, Pug.
4-roll Raymond.

MIXERS
2190 cu. ft., Powder.
140 cu. ft., double shaft, Paddle.
20 cu. ft., Ajax #3, Dough.

PIPE & FITTINGS
3" ID #28 Karbate Pipe (1700 ft. NEW).
(We have a large quantity of new Haveg & Karbate in stock.)

PULVERIZERS
Raymond #1, complete unit.
Allis-Chalmers #1 Pulverator.
Jeffrey 24"x18" Hammer.

REACTORS
400 gal., glass-lined, Pfaudler, ASME.
500 gal., glass-lined, Pfaudler, ASME.

REBOILER
2200 sq. ft. 84" IDx16', 40 PSI.

STILLS
600 gal. 57"x8' copper, shell 25 PSI, jacket 100 PSI.
1500 gal. 66" IDx10'x1" cast iron.

TANKS & PRESSURE VESSELS
3400 gal. 7'4"x10'x⅜" type 430 SS.
6000 gal. 8'x15'x⅜" vert. Aluminum
6500 gal. TANK CAR TANKS.
8200 gal. 70"x40'x2" 390 PSI (4).
8500 gal. 8'x23'x5/16" vert. (NEW).
12000 gal. 8'x32'x¼" (NEW).
15000 gal. 10'6"x23'x¼" (NEW).
16000 gal. 96"x45'x¾" ASME 150 PSI.
30000 gal. 10'x47' ASME 50 PSI.
(We have facilities for building new tanks. We welcome your inquiries.)

TANKS—LEAD LINED
525 gal. 42"x7' vert. agit.
900 gal. 5'x6' vert. agit.
1200 gal. 5'x8' vert.

PHONE OR WRITE FOR COMPLETE DESCRIPTIONS, PRINTS & PRICES
ASK FOR OUR CURRENT CATALOGUE • SEND US YOUR SURPLUS EQP'T. LISTS

Heat and Power Co., Inc.
70 PINE STREET | HAnover 2-4890 | NEW YORK 5, N. Y.
MACHINERY & EQUIPMENT MERCHANTS

ALUMINUM KETTLES—275 gal. Agitated, Jackets.

PUMPS—Viking 4" w/ 10 HP motor.

PUMPS—Centrifugal, New to 650 gpm—motors.

PULVERIZERS—Raymond #1 w/ cycl—Sturtevant #1 Ring. Wms. LG-1, Req. #1, GA 30, w/ motor.

CRUSHERS—8x14, 11x20, 14x28, 48x60.

SCREENS—Tyler Hummer 3x5, with 1/2/3/ decks.

HARDINGE MILLS—6'x22", 7'x48", 8'x22".

MOTORS—Reconditioned to 100 HP, Slow.

DUST COLLECTOR—4 compt. Dracco 1080 sq. ft.

RAYMOND 6' Whizzer.

FILTER PRESSES—24", 30", 36", 42", Some washing, open and closed delivery.

LAWLER COMPANY
Durham Avenue Metuchen, N. J.
Metuchen 6-0245

STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED — 1400 gallon capacity. Welded construction—Fully insulated. Equipped with manhead. Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

VARNISH TANKS—USED—54" diameter x 14'6" high (or long) ¼" Steel — Welded construction — 1700 gallons.

MISCELLANEOUS TANKS—Various sizes and types.

ERMAN-HOWELL DIVISION
LURIA STEEL & TRADING CORP.
332 South Michigan Ave.
Chicago 4, Ill.
Telephone: Wabash 2-0250

FOR SALE

INCONEL TUBING & PIPE
All Sizes to 3" O.D.

INCONEL SHEET
.093 x 36" x 96"— 8500#
.125 x 36" x 120"—34000#

No CMP—Prompt Delivery
ALL MATERIAL NEW & PRIME

SABIN METAL CORP.
366 Broadway New York 13, N. Y.

MOTOR GENERATOR SETS

	3,000 KW,	G.E.,	Synch.,	250 volt DC,	13800 volt AC
	1,000 KW,	A.C.,	Synch.,	250 volt DC,	4150 volt AC
	250 KW,	C.W.,	Synch.,	250 volt DC,	220/440 volt AC
	200 KW,	A.C.,		275/300 volt DC,	2300 volt AC
	150 KW,	West.,	Synch.,	250 volt DC,	2400 volt AC
(2)	150 KW,	West.,	Synch.,	125 volt DC,	220/440 volt AC
(2)	125 KW,	G.E.,	Synch.,	250 volt DC,	2400 volt AC
	100 KW,	Delco,	Synch.,	250 volt DC,	2300 volt AC

SYNCHRONOUS MOTORS

HP	MAKE	TYPE	SPEED
475	West.		720
300	G.E.	ATI	900
200	West.(2)		900
180	G.E.	ATI	900
150	G.E.	TS-963	1200
150	G.E.	TS-965S	720

SLIPRING MOTORS

HP	MAKE	TYPE	SPEED
600	C.W.	131-AQ	507
500	G.E.(2)	IM	450
400	G.E.	IEM-17B	870
250	G.E.	IM-17B	450
200	G.E.	MT-559Y	1175
150	G.E.	IM	870

230 V. D.C. MOTORS

HP	MAKE	TYPE	SPEED
300	G.E.(3)	MPC	500
250/200	Rel.	2600T	400/800
200/130	C.W.	CMC-125H	450/900
187½	G.E.	MDS-418AR	435
150	West.	SK	1150
150	West.	SK	850
150	G.E.	LC	1750
125	Rel.	T	600

L. J. LAND, INC.
STONY CREEK MILLS
READING, PA.
TELEPHONE 4-4953

ROTARY DRYERS
1—70" x 33' Ruggles Coles A-10.
Single Shell: 4x30, 4x45, 5x30, 6x35, 5½x7x60.

MISCELLANEOUS EQUIPMENT
Hammermills: Jeffrey 36 x 24 B, Williams #30 Slugger & Gruendler 30x36 Reversible.
Dings 60"—3 Roll Type I.R. Magnetic Separator.
5', 10' & 16' Mechanical Air Separators.
8 x 6, 6 x 6, 6 x 10 & 7 x 6 Ball Mills
#0 & #71 Raymond Automatic Pulverizer.
4x45, 6x60, 5½x7x60 & 8x60 Rotary Kilns.
2 Sly Type 360 Dust Filters, each 19000 sq. ft.
150000 c.f.m. Multiclone Dust Collector.
10'x48" & 10'x36" Hardinge Air Classifying Ball Mills.
4'x7' Peripheral Discharge Rod Mill.
Heavy Media Separation Unit.
Hercules Junior 3 Roll Pulverizer.
Clyde-Kunts Continuous Hydrator.
7 Elec. Air Compressors, 1250, 2160 & 3374 Ft.
135—8000 & 10,000 Gal. Tank Cars.
45 Ton Plymouth Diesel Locomotive.
1750 ft. Chgo. Pneu. Elec. Compressor.
STANHOPE, 60 E. 42nd St., N. Y. 17, N. Y.

Cast Your Eyes Over These BRILL Buys!

Outstanding Selections Backed by Our Quarter Century of Service and Dependability!

DRYERS—KILNS

2—Vulcan 7' x 160', 7' x 110', ⅜" shell, 2-12" tires, complete.
1—Allis-Chalmers 10' x 90', 9/16" shell, 2-14" tires, complete.
1—Ames 6' x 60', ¾" shell, 2-8" tires.
1—Vulcan 4½' x 50', ⅜" shell, 2-6" tires.
1—5' x 15' brick-lined, 2 tires complete.
6—Rotary Dryers 7' x 70', 7' x 60', 5' x 67', 4'6" x 40', 4' x 25'.
3—Louisville Rotary Steam Tube Dryers 6' x 50', 6' x 30', 3' x 20'.
1—Louisville Rotary Steam Tube Dryer 6' x 27', S.S. tubes.
2—Devine 17 shelf double door vacuum Dryers 59" x 78".
2—Devine 10 and 6 shelf vacuum dryers 40" x 43".
5—Stokes & Buflovak Rotary Vacuum Dryers 30" x 8', 3' x 15', 6'6" x 38'.
5—Buflovak 60" x 144", 42" x 120", 32" x 90" Atmospheric Double Drum.
1—Single Drum 60" x 80" Flaker.
1—14 Truck steam heated Dryer 1680 sq. ft.
3—Buflovak 6' diameter, Vacuum and Atmospheric Crystallizers.

FILTERS

2—Oliver Monel 8' x 10' Rotary-Vac Filters.
2—Oliver 5'3" x 3' Rotary Vacuum enclosed Precoat Filters.
7—Oliver Rotary Vacuum 11'6" x 14', 8' x 12', 8' x 10', 8' x 8', 3' x 1'.
3—Eimco Rotary-Vac 8' x 8', 4' x 5', 4' x 4'.
1—Feinc Rotary Vacuum 8' x 12' steel.
1—Sweetland #12 with 36 leaves.
1—Sweetland #7 with 27 leaves.
1—Sperry 36" Recessed, 48 chambers, c.i., open delivery.
5—Shriver 30" P&F, 30 chambers, c.i., open delivery.
8—Sperry 24" P&F, 16 chambers, c.i., closed delivery.
1—Shriver 24" Recessed, 30 chambers, c.i., open delivery.
3—Shriver 18" Recessed, 30 chambers, c.i., open delivery.
2—Sperry Aluminum 30" and 24" P&F, 22 and 26 chambers.
10—Shriver, Sperry Filter Press Skeletons 42" to 18".

CENTRIFUGALS

1—Fletcher 48" Suspended Aluminum bottom discharge, perforated basket, motor-driven.
1—AT&M 42" Suspended SS, bottom discharge, perforated.
1—Fletcher 40" Suspended, bottom discharge, SS, perforated basket.
1—Tolhurst 32" Suspended Monel, bottom discharge, perforated.
1—Fletcher 30" Suspended Steel, bottom discharge, perforated.
1—Tolhurst 26" suspended Monel, bottom discharge, perforated.
1—Tolhurst 26" suspended, steel, bottom discharge, perforated.
2—Bird 36" x 50" solid bowl, rubber and stainless.
1—Bird 36" x 50 solid bowl, steel.
1—Bird 18" x 28" solid bowl, steel.
2—Sharples #16P Monel Super Centrifuge.

LIQUIDATION

1—New Vulcan 8'x83' Kiln.
1—Peabody 25,000 CFM Scrubber.
3—Concrete Stave Tanks 20'x20' with acid lined brick.
6—Butler Barrel Loaders and Morgan Drum Fillers.
6—Steel Storage Bins 15'x12', Cone bottoms.
3—Riley Coal Crushers
1—American Pulverizer Co. 24x24 ring Crusher, 30 HP motor.
1—103' centers, scraper flight Conveyor.
1—Electro Dryer, size X, Type CH, 3,000 cubic feet.
2—West. Frequency Changers, 60 KW with 60 HP motors.
11—Atomizer Assemblies with 20 HP, 10,000 RPM Vert. motors.
2—Durimet 6x6 Cent. Pumps.
1—Goslin Birmingham 4'x8' solid nickel Flaker.
2—Milton Roy Duplex Proportioning Pumps, 212 GPH @ 1500# pressure.
1—New Link Belt 3'10" x 16' SS Roto-Louvre Dryer.
1—Buflovak 4½' x 9' steel jacketed Ball Mill, 300# internal, 125# jacket.
1—Jeffrey 5'x9' Monel Vibrating Hot Air Table Dryer.
Harrishoff Furnaces, 6'6" and 8'6" diameter, multiple hearths.
3—Hardinge 8' x 36", 7' x 36", 6' x 22" brick lined Conical Ball Mills, motor driven.
4—HCL Absorber Assemblies.
1—10' x 50' Horizontal Storage Tank ASME 50#.
1—#10 Sweetland with 27 steel leaves.
2—Heat Exchangers 370 square feet, 316 SS, floating head ASME.
2—Pfaudler 100 gallon, glass lined Stills with condensers and receivers.

PULVERIZERS

2—Raymond 4 roll High Side Mills, complete.
1—Hardinge 4½' x 16" Conical steel-lined Ball Mill, 30 HP motor.
1—Bauer 36" Attrition Mill 2-50 HP motors.
17—Patterson, Abbe Pebble & Ball Mills 60 to 1000 gals.
2—Premier Colloid Mills 8" dia., S.S.
1—Eppenbach QV7 Colloid Mill.
2—Jeffrey 36" x 24", 20" x 12" Hammer Mills.
3—Raymond, Gayco Mechanical Separators 14', 12', 4'.
1—2 Roll Rubber Mill 6" x 12".
2—Mikro No. 1S1, No. 1SH Pulverizers.
1—Fitzpatrick Comminuting Mill 7½ HP.

SCREENS

1—Selectro S.S. double deck 4' x 10'.
5—Sprout Waldron S.S. sgle. deck, 40" x 84".
1—Robinson Triple Deck 40" x 104".
4—Rotex #42, #22 and #11 Single and Double Deck Screens.
5—Tyler Hummer 3' x 5' Triple Deck.
1—Abbe #2 Blutergess Sifter.
1—Selectro Double Deck 18" x 48".

MIXERS—ALL TYPES

4—Baker Perkins 200, 100, and 50 gallon, jacketed, double arm, sigma blades.
1—Baker Perkins 300 gal. Unidor S.S.
1—Baker Perkins ½ gal., jacketed.
1—Baker Perkins, type JNM, 100 gal., jacketed, double arm.
1—Day 30 gal. Imperial jack. double arm.
10—Rodgers 200 to 3000# Powder Mixers.
12—Electric, Port. Agitators ¼ to 5 HP, NEW.
4—Day, Ross, 8 and 50 gal. Pony Mixers.

MISCELLANEOUS

20—Bucket Elevators, steel housing, 34' to 90' centers, 8" x 5" to 24" x 8" buckets.
7—Stokes Vacuum Pumps 15 to 100 CFM.
5—Devine, Buflovak, Condensers and Receivers, 20 to 90 sq. ft.
4—Groen 150, 125 gal., S.S., jacketed, agitated, kettles.
4—Stokes DD2, D4 Rotary Tablet Machines.
4—38" dia. Stainless Steel Revolving Pans.
2—Nash #4, AL671 Vacuum Pumps.
7—Olivite, Duriron, rubber, Karbate and Haveg Centrifugal Pumps 6" to 2".

BRILL EQUIPMENT COMPANY
A SINGLE ITEM OR A COMPLETE PLANT

BRILL EQUIPMENT COMPANY
2401 THIRD AVENUE · NEW YORK 51, N. Y.
Telephone: CYpress 2-5703 · Cable: Brilten, N. Y.

BRILL FILLS THE BILL! Write, wire or phone us for complete information

QUICK DELIVERY ON GUARANTEED EQUIPMENT

SPECIAL: Vallez Filter 41 Stainless Covered 44½" Dia. Leaves.

DRYERS & KILNS

Devine #12 Vac. Shelf Dryer, 40"x42" shelves.
2—Ruggles Coles 7½' x 60' & 6' x 40' Rotary Dryers.
1—Ruggles Coles 54" x 25' Rotary Dryer.
1—Christie 90" x 60" Rotary Indirect Htd. Dryer.
2—4 fan automatic Conveyor Dryers.
2—Albright-Neil 4' x 9' Atmos. Drum Dryers.
1—Buffalo Vac. Drum Dryer 24" x 28".
Gehnrich Gas Fired Dryer, 12 trays 21" x 32".
6—Steam, Gas & Electric Dryers, Tray & Truck.
New Tray & Truck Atmos. Dryers, good deliveries.

CENTRIFUGALS & CENTRIFUGES

5—Tolhurst 40" Suspended Type Centrifugals. Bottom Discharge. Motor Driven.
6—Centrifugals 20", 30", & 48", Steel, Copper, Stainless & Rubber Lined.
12—Sharples Centrifuges #5A Stainless. Also #6.
3—De Laval Multiple Clarifiers #200, 300 & 301.

FILTERS

1—Vallez 41 Stainless Covered Leaf Filter, type 49.
10—Sperry & Shriver 12", 18", 24", 30", 36", Iron Filter Presses. Also 12" Bronze.
Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

1—Dopp 350 gal. Cl Agit. Jack. Vac. Kettle.
Devine 36" dia. Impreg. Unit. closed Jack-Liquor & Impreg. Kettles. Also 100 gal. size.
Devine 1000 gal. closed jack agit. steel kettle.
1—2300 gal. vert. agit. Jack Steel Kettle.
8—Jacketed Kettles 50 to 2500 gals.
1—250 gal. Lead Lined Kettle.
2—Pfaudler 500 gal. vert. Glass Lined Tanks.
4—10,000 & 4,000 gal. Horiz. Steel Tanks.
New Stainless Steel Tanks 50 to 3000 gals.
50—Stainless Alum., Copper, Glass & Lead Lined Kettles & Tanks. Also new Stainless.
6—Copper Varnish Kettles 150, 200 & 300 gals.

PULVERIZERS & MILLS

#1 Raymond Automatic Pulverizer 20 H.P. motor.
1—Raymond #50 Pulverizer 30 H.P. Complete.
1—#2000 Raymond Mills.
1—Hammer Mills & Pulverizers 3 to 50 H.P.
1—Schutz-O'Neill 20" Pulverizer. Also #1.
1—Sturtevant 30" Rock Emery Mill.

1—Robinson 22" Attrition Mill.
1—Lehman 4 Roll W. C. 12x36" Steel Mill.
5—Lehman & Kent 3 Roll Steel Mills.
8"x22", 9"x32", 12"x36", 16"x40".
1—9" x 36" Double Steel Roller Mill.
1—4" x 24" 3 pr. high steel Roller Mills.
3—Hoschin 18" x 36", 4 Roll Granite Stone Mills.
2—Abbe 24" x 32" Pebble Mills. Also Jar Mills.
4—Bait & Jewell & Leominster Rotary Cutters.
2—U. S. & Premier 1½ H.P. Colloid Mills.

MIXERS & SCREENS

Baker-Perkins heavy duty double arm Mixers, 100, 50, 9 & 4½ gals. Motor driven.
Horiz. Mixers single & double arm to 200 gal.
2—Day & Ross 15 gal. Pony Mixers.
1—Century 2 HP. 4 speed Vert. Mixer.
6—Lead & Paste Mixers 50 to 150 gals.
1—Tyler 3'x5' Vibratory 2 Deck Screen.
Patterson 3½ dia. Stainless Conical Blender.
1—Master Drum Type Blender 1000#.
10—Dry Spiral Mixers 50 to 2500#.
12—Portable Elec. Agitators ¼ to 3 HP.

MISC. & SPECIAL

2—Buffalo 6' dia. Vac. Crystallizers.
Gould 75 HP. Centrifugal Pump, 250 PSI.
4—French Oil Motor Driven Expellers.
New 6" x 12" Lab Mixing Mills and Calenders.
Farrel 6" x 12" 2 Roll Lab Mill.
4—Farrel 2 Roll Rubber & Plastic Mills.
3—Rubber & Plastic Extruders 1" to 6".
1—Stokes 2E Pasta Filler up to 5 gal.
1—Marco #200 Stainless Steel Homogenizer.
6—Stokes & Smith & Day Powder Fillers.
6—Filling Machines. Liquid Paste & Powder.
Rotary & Single Punch Tablet Machines, ½" to 3".
2—Howe Mogul Barrel Bag Packers.
2—Revolving Pans 30" & 36".
4—Stokes Vert. High Vac. Pumps.
2—Worthington 12" x 12" Vac. Pumps.
6—Devine & Buffalo Vac. Pumps.
Seas Machinery for Toilet Laundry Chip Liquid.
Plastic & Rubber Hydr. Presses, Extruders & Injection Molding Equipment.
Roller & Screw Conveyors. Bucket Elevators.
Boilers—Gas, Oil & Coal Fired.

WE BUY YOUR SURPLUS MACHINERY & COMPLETE PLANTS

PARTIAL LISTING, WRITE FOR BULLETINS. PHONE STERLING 8-9066

STEIN EQUIPMENT COMPANY

107 - 8th St., Brooklyn 15, N. Y. *Sterling 8-1944* Cable Machequip

IN STOCK—*NEW*

STAINLESS STEEL TANKS

2—5700 gal. Horiz. T304
1—5700 gal. Horiz., T316
1—4200 gal. Vert., closed, flat heads, T304
1—3000 gal. Vert., closed, flat heads, T304
2—1000 gal. Vert., open, T304
2— 750 gal. Vert., closed, 30# Pr., T304
2— 500 gal. Vert., closed, 30# Pr., T304
3— 500 gal. Vert., open, T304
4— 300 gal. Vert., open, T304
4— 200 gal. Vert., open, T304
5— 100 gal. Vert., open, T304
2— 60 gal. Vert., open, T304
7— 30 gal. Vert., open, T304

Lighter weight tanks fabricated to your specifications (10, 12, 14 & 16 ga.). Large quantity of type 304 and type 316 sheets carried in stock assuring quick delivery of tanks. Heliarc welding. Water quenched welds (if specified).

PERRY
PRODUCTS COMPANY

1413 N. 6th St. Phila. 22, Pa.

For Sale **For Sale**

1—Eppenbach Stainless Steel Home Mixer, complete with a 7½ HP Explosion-Proof Motor.
1—Baker-Perkins 100 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 20 hp explosion-proof motor.
1—J. H. Day #2, 75 Gal. Brighton Mixer.
5—Pebble Mills 40 to 500 Gal.
10—Pony Mixers, 8, 15 and 40 Gal.
HIGH SPEED Roller Mills 9"x24" to 16"x40".
1—Motor Driven Belt Conveyor.
3—6" Premier Colloid Mills, watercooled.
2—#281 Mikro-Pulverizers with 10 hp Motors.

SPECIALIZING IN REBUILT MACHINERY

Irving Barcan Company
249 ORIENT AVE.
JERSEY CITY 5, N. J.
Phone—DElaware 2-6695-6

NEW YEAR - OLD PRICES

1—Tolhurst 48" S.S. Center Slung Centrifuge.
2—Bird 48" S.S. Sus. Style Centrifuges.
1—Buflovak 6' Jack. & Vac. Crystallizer.
1—Devine 13 Shelf Vac. Dryer 40" x 43".
1—Stokes 138 Vac. 6 Shelf Dryer 24" x 36".
1—Sweetland #12 Filter 72 Leaves.
3—Wood Plate & Frame Filter Presses 18" & 24".
2—Sperry 36" Cast Iron Presses, Hyd. Closures.
4—Stainless Kettles with Agitators 100 to 150 Gals.
1—Stainless Steel Kettle 900 Gallons with Ag.
3—Dopp C.I. Kettles 60, 250 & 650 Gallons.
3—Stainless Jack. Kettles 300 Gals. D.M. Ag.
4—Mikro Pulverizers—Bantam SH to 2 TH.
1—Rotex Screen 40" x 120" Motor Drive.
3—Alum. 27" & 36" Bubble Cap Columns.
2—Erie City 200 H.P. Economic Boilers 150# W.P.
3—Horiz. Steel Tanks to 20,000 Gals.

We Buy Single Items to Complete Plants.
Send for Complete Listings.

The MACHINERY & EQUIPMENT Corp.
533 West Broadway New York 12, N. Y.
GRamercy 5-6680

AMERICAN DOUBLE DRUM DRYER—30" x 100" —S/S trim Fitzpatric Mill included—Complete.
GRUPE DRYER—6' dia. 25' long—44-3" tubes—Complete.
STOKES VACUUM PUMP — 105 cfm — complete with motor.
LIGHTNIN D-2 AND D-2A—slow speed—portable agitator.
BUFLOVAK DOUBLE DRUM DRYER—36 x 84 galvanized trim—complete.
30 x 30 P & F FILTER PRESS—32 plates—33 frames—open del'y.
36 x 36—RECESSED PLATE FILTER PRESS—39-2½" thick plates open del'y.
In stock at All Times: NEW & USED KETTLES —5-1000 gal. S/S and plain steel.
ROBINSON—SIZE 12-DOUBLE RIBBON MIXER —42"W x 48"D x 9' long. Complete with motor.
ROBINSON GARDINER type Mixer—Model "J"—42.5 cu. ft. capacity.
2-5000# DOUBLE RIBBON MIXERS—Jacketed—100#—W.P.
2—BAKER PERKINS—DOUBLE SIGMA ARM—Jacketed Mixers—150 gal. cap.
PORTABLE AGITATORS—with new motors.
ADDITIONAL MIXERS IN STOCK—Ribbon & Sigma Blade Laboratory to 5 ton W.C.
3000 GAL. S/S HORIZONTAL TANKS—Insulated —complete with agitator and motor.
600 GAL. TANK—S/S—58" dia. x 36" deep.
NEW—1 HP Side entering agit. W/motors & Cover.
COMPLETE LINE OF S/S & PLAIN STEEL TANKS—in stock at all times.
SWENSON QUADRUPLE EFFECT EVAPORATOR—Complete—Brand New.
BUFLOVAK VACUUM DRUM DRYER—Laboratory size—24" dia. drum-20" long. Complete with pumps and condensers. Like New.
We have a complete inventory of Chemical Processing Equipment on hand at all times.
SEND US YOUR INQUIRIES
WE BUY ONE ITEM OR ENTIRE PLANTS

AARON Equipment Company
1347 So. Ashland Ave., Chicago 8, Illinois
PHONE: CHesapeake 3-5300

YOUR PREFERRED SOURCE FOR GOOD REBUILT EQUIPMENT

Patersen Jktd. 6' x 16' Ball Mill Chrome Mang.
Louisville Dryer 6' x 50' complete unit
Autoclave, 3500 gal. 300# Int. Jktd & Agtd
Fletcher Centrifuge 40" SS two speed motor
Williams 4 Roll Low Side Mill Complete with 60 HP
Sparkler SS Filter, Model 33-D-17, Like New
Buflovac Vac. Shelf Dryers. 20 Shelves 40" x 42"
Ross 40 gal. Heavy Duty Pony Mixers
Ball & Jewel #1½ SS Rotary Cutter 40 HP motor
Pfaudler Glass & SS Reactors, 30, 50 & 100 gals.
Robell #31 Screens 20" x 48" with motor
Day Lab. 5 gal. Vac. Mixer, SS Jktd, Sigma Arms
Mikro #4 Pulverizer with 40 HP 3 ph. motor
Mikro #6 Atomizer Complete Unit & 20 HP motor
Bambury #3 Mixer with 100 HP 3 ph. motor
Stokes 48" x 108" Double Drum Dryer Complete Unit
Buffalo 42" x 120" Double Drum Dryer Complete
Sparkler S/S Filter Model 14-S-7. Never Used
A T & T 60" type 316 SS Centrifuge 10 HP motor
Bird 40" x 60" Continuous Filter Rubber Covered
New, Used & Rebuilt Ribbon Blenders Steel & SS
New, Used & Rebuilt Kettles, Tanks & Reactors
All Sizes & Metals—Send Us Your Specifications

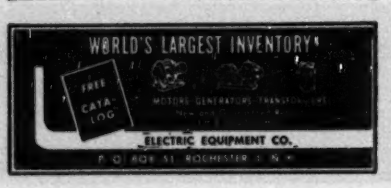
WHAT HAVE YOU FOR SALE?
for BETTER BUYS & SERVICE
Phone SOuth 8-4451—9264—8782
You can BANK on

EQUIPMENT CLEARING HOUSE, INC.
289-10th ST., BKLYN 15, N. Y.

STEEL STORAGE TANKS

3—30,000 Gal. 11' x 43' x ⅜" Horiz.
12—10,000 & 20,000 Gal. 5/16" Horiz.
14—8,000 & 10,000 Gal. R.R. Car Tanks.
6—1,000, 5,000 & 10,000 Bbl. Vert.

TANKS LOCATED ILL., N. Y., KANS.
Lestan Corp., Rosemont, Pa.



DEAERATOR TANKS

20 Unused rubber-lined A.S.M.E. U-69 Code tanks. 1'6" dia. by 56'0". 50 PSI internal pressure. Capacity 40,000 gals. Alterations to suit your requirements. Immediate delivery at $13,000 ea. subject to prior sale. For specifications and additional data, contact TODAY

GEORGE R. MARVIN COMPANY
1601 TAYLOR WAY TACOMA, WASHINGTON

FOR SALE—WE OWN IT OR CONTROL IT!

COLUMNS—STILLS

2 Aluminum Bubble Cap Columns, 36" dia. x 45 plate.
1 Aluminum Bubble Cap Column, 27" dia. x 18 plate.
1 Aluminum Perforated Plate Column, 28" dia. x 36" plate.
1 Copper Column with 18—30" dia. perforated plates and 10—24" dia. bubble cap plates.
1 Steel and Cast Iron Bubble Cap Column, 30" dia. x 62 plate.
1 Stainless Steel T316 direct fired Vacuum Still, 325 gal.

CONDENSERS—EXCHANGERS

3 Aluminum tub. 166 sq. ft.
15 Alum. Coil Exch. 47 sq. ft.
7 Copper tub. 20, 65, 90, 95, 140, 325, 725 sq. ft.
3 S.S. tub. 8½, 330 & 400 sq. ft.
3 S.S. Coil Condensers, 40 sq. ft., 60# pr.

DRYERS—EVAPORATORS

1 Stokes #59A Jacketed Vacuum Rotary Dryer, 18" dia. x 42" long.
2 Atm. Double Drum Dryers, 22" x 38".
1 Cummer Rotary Hot Air Dryer, 48" dia. x 26' long.

FILTERS

1 Sweetland #10, 21 lvs.
1 Sweetland #12, 72 lvs.
1 Swenson Rotary Continuous Vacuum Filter; Precoat type, 8' dia. x 8' face, rubber covered and lead acid proof construction.
1 FEINC Rotary Vacuum Filter, string discharge, 4'6" dia. x 6' face, aluminum.
4 Pressure Leaf Filters, 70 to 90 sq. ft.
2 Shriver 36" Filter Presses, rubber covered, closed dely., washing, hydr. closing.
1 Louisville 8-roll Continuous Filter or Grains Press 24".

NOW LIQUIDATING

Equipment of Patrick Henry Brewery, Marion, Indiana:
32—Horiz. Welded Steel Tanks, dished heads: 10,500, 11,300 and 12,700 gal.
6—3500 gal. Vertical Closed Welded Steel Tanks, dished heads.
22—8300 gal. Welded Steel Rectang. open top tanks—16'10" L x 7'7" W x 8'9" H.
1—4000 gal. Vertical Steel Cooker, Jktd., Agit.
1—Dracco Pneumatic Grain Conveying System.
1—Sperry 24" C.I. Filter Press, 16 Ch.
3—Ammonia Compressors with motors: 10 x 10 (82 ton); 9 x 9 (60 ton).
4—Steel Shell & Tube Ammonia Condensers: 300 sq. ft. and 1000 sq. ft.
8—50 cu. ft. Steel CO_2 Storage Tanks ASME, 245# WP.
2000 ft. of Gravity Conveyor, Power Belt Conveyor, etc.
Lot of miscellaneous equipment—pumps, coolers, scales, kettles, tanks, conveyors, bottling machinery, machine shop and office equipment, etc.

JUST PURCHASED

1—450 gal. Stainless Steel Jktd. Agitated Kettle.
1—250 gal. Aluminum Jktd. Agitated Kettle.
1—1500 gal. Steel Jktd. Vacuum Kettle.
1—Acme #8½A Jaw Crusher, 9x16 opening; 20 HP motor.
2—1,000 gal. Stainless Steel Tanks, T316, vertical, closed top.

KETTLES—REACTORS

1 6 gal. Nickel Autoclave, agit., 1000# pr.
1 Stainless Steel, Type 347 Autoclave or pressure tank, 250# pr., Elec. heated 850° F; 17¼" dia. x 9' high.
70 Stainless Steel and Stainless Clad open top, steam jacketed kettles—10, 40, 60, 80, 100, 150, 250, 500 gal. sizes.
1 Stainless Steel Kettle, 950 gal., 20# jkt. pr., vertical agitator, Type 347 shell, bolted C.I. top.
3 300 gal. T316 Stainless Steel Jacketed Tanks, 10# jkt. double motion agit.
1 200 gal. Read Stainless Steel Jacketed Kettle, double motion agit. 10 HP.
1 3000 gal. Horiz. Steel Cooker, Vacuum, Agitated.
4 Aluminum Reaction Kettles, Jktd. & Agit., 25, 60 & 100 gal.

MILLS—PULVERIZERS

1 Paul Abbe #6 Pebble Mill, porcelain lined, 32" x 36".
1 Hardinge Conical Ball Mill, Steel Liner, 4'6" dia. x 24" long.
1 Williams Hammer Mill, type AK; size A, stainless steel.
5 Mikro Pulverizers, #1-SH, #1-SI, #2-SI, #2-TH.
2 Premier Colloid Mills, 6" st. st. rotor, type U-3 & V-3.

MIXERS—AGITATORS

12 Vertical Agitators—40 HP gearmotor with Turbo #5B vertical drive, steel shaft and turbine impeller 70 RPM.
1 Porter heavy duty jacketed double worm mixer—75 gal.
1 Dellenberger 100 gal. Heavy Duty Double Arm Mixer, fish-tail blades, jacketed.

NOW LIQUIDATING

Equipment of Chemical Manufacturing and Distributing Co., Easton, Pa.:
1—500 gal. Pfaudler glass lined kettle
1—Lightnin Agitator 3 HP—431 RPM
1—Mikro Pulverizer #1-SI
1—Viking Rotary Pump, 3", 20 HP
1—1000 gal. Stainless Clad Tank
1—2000 lb. Jacketed Powder Mixer
3—Ribbon Mixers—2000#, 1000#, 800#
Lot of Steel Storage Tanks, Kettles, mixing tanks, pumps, scales, etc.

TANKS

35 Aluminum Tanks, closed, 4, 275, 330, 480, 500, 1350 & 1450, 9000 gal.
15 Horiz. Welded Steel Tanks, Lastiglas Lined, 15,200 gal.
1 Vertical Rubber Lined, 6000 gal, open.
5 Vertical Jacketed Pressure Tanks—Steel—30# steam jacket—6mm vacuum internally:
3—34" ID x 15' H (approx. 700 gal.)
1—23" ID x 10' H (approx. 230 gal.)
1—23" ID x 9' H (approx. 195 gal.)
8 15,000 gal. Vertical Welded Steel Closed Fermenting Tanks, 80 lbs. W.P., turbine agitator with 40 HP motor; 970 lin. ft. 3" pipe coil. Excellent condition.

STAINLESS STEEL TANKS IN STOCK

1 16,200 gal. Vert., closed, T304—NEW
1 5700 gal. Horiz. T304—NEW
1 4200 gal. Vert., closed, T304—NEW
1 1400 gal., Vert., open, 10' L x 57" W x 57" D
2 1000 gal. Vert. T304
2 500 gal. Vert., T304—NEW
50 Stainless Steel Tanks—from 9 gal. to 500 gal. sizes
9 3000 gal. Horizontal Stainless Steel Tanks, 5'4" dia. x 18'9" long, insulated and agitated. Excellent for transporting, storage or holding.

MISCELLANEOUS

1 Bin, 400 cu. ft., T316, St. St.
2 Bird Susp. Centrifugals, 48" dia. Stainless Steel Perforated Baskets.
1 Bird Suspended 48" Steel Centrifugal. Perforated basket; Bottom discharge.
1 Fletcher 30" Jr. Centrifugal Extractor, St. St. Imperf. basket.
5 DeLaval Centrifuges, models #600, 74-11 and 94-01.
1 Deionizing System, 500 GPH. Zeolite.
2 Kux Machine Co. Model 25 Rotary Pellet Presses, 21 and 25 punch.
3 Stokes Rotary Pellet Presses, 16 punch, B-2, D-3.
1 Byron Jackson Deep Well Pump, 150 GPM 325' head, NEW.
4 Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.
1 Stainless Steel Horizontal Sterilizer or Steam Retort, 10# pr., 24"W x 26"H x 36"L.
1 Stokes Vertical Steel Jacketed Vacuum Chamber and Impregnating tank, 30"L x 25"W x 24"D.

STAINLESS STEEL FABRICATION

"Heliarc" welding. Water-quenched welds (if specified). Specializing in lighter weight tanks (10 ga., 12 ga., 14 ga., 16 ga., etc.). Large quantity of type 304 and type 316 sheets carried in stock assuring quick delivery of tanks built to your specifications. Over 30 NEW tanks in stock for immediate shipment—from 30 gal. to 5700 gal. sizes.

Write: Attn. Fabricating Division

PERRY EQUIPMENT CORP.

1413 N. 6th ST.
PHILA. 22, PA.

PHONE
STEVENSON 4-7210
CABLE—PERI

EMC

Explore Your Equipment Needs In the Most Diversified Stock In the Machinery Industry!

3497 S1	Tolhurst 26" Suspended Type Steel Centrifugal; plow discharge.
3497 S3	Tolhurst 40" Everdur basket; suspended; plow discharge; 2 speed motor.
C4-122	Fletcher Suspended Centrifugal; 40" Steel Basket; plow; 2 speed motor.
4 Me 1152	Bird 12" Rubber and Lead Lined Centrifuge with imperforate and perforate baskets; 1 HP 1750 RPM
BB177-178	Two Bird Rubber Covered 48" Suspended Type Imperforate Basket; with 40 HP 2 Speed Motors.
3240 M3	Sharples Supercentrifuge Type M84-21-IJY stainless with 5 HP.
2540 C2	Sharples Steel Centrifuge Type M4P-IJ 15000 RPM.
3269	Sharples De-Waxing Centrifuge; Type DM202-23C.
2946 M4	Tolhurst 40" over driven self balancing Centrifugal with Copper perforated basket; 7-½ HP motor.
3397	Eppenbach QV8" Colloid Mill with 5 HP motor.
1699	U.S. L2 Stainless Steel 3-¼" Mill with 2 Meters 3 HP.
H2-179	Premier Stainless Steel 8 U4 Colloid Mill with 20 HP.
H2-178	Manton Gaulin Stainless Steel Homogenizer with 40 HP.
3316 E1	Premier Type U3-10" S.S. Colloid Mill with 30 HP.
3272 L1	Premier L1S . . . 15" Colloid Mill with 30 HP motor.
3407	Buffalo Vacuum Chamber Dryer; 20 shelves 46" x 42" with vacuum pump, condenser, receiver, etc.
3289	Stokes 16 Shelf Steam Heated Dryer; 3' x 3'; 6'10" overall.
3259	Horizontal Dryers 66" x 14'7" long; with tracks; 2-½" steam pipe with capstan closing doors each end.
1390 MeA	2 Struthers Wells Stainless Drum Dryers 5' x 10' complete with accessories.
3026	Buffalo Rotary Vacuum chrome plated Drum Dryer; 5' x 12' with accessories.
1100	Buffalo Rotary Vacuum Drum Dryer, bronze, 5' x 12' with accessories.
1101	Devine Vacuum Drum Dryer, bronze, 62" x 10'6".
3414	Rotary Drum Dryer with steam heated nickel drum; 48" x 46".
2877	Buffovak Double Drum Dryer; 32" x 72" with accessories.
3315	Bagley & Sewell Double Drum Dryer; 28" x 60".
3418	Adt Class G Rotary Dryer 2' x 15'; Indirect Gas heated.
3364	Squier Hexagonal Shell Stainless Atmospheric Dryer; 30" x 20'; stainless feed and screws.
3168	Louisville Counter Current Monel Lined Atmospheric Dryer; 30" x 16".
3499	NEW steel double ribbon Mixers; 24 cu. ft.; 50, 50 and 70 cu. ft.
3350	J. H. Day Jumbo Mixer; 44" x 78" complete with motor.
M29-111	J. H. Day Stainless 5 Gal. Double Arm Jacketed Mixer with Vacuum Cover.
3333	Sprout Waldron Double Ribbon Mixers; 233 cu. ft.; 5' x 10'.
3102	J. H. Day Ribbon Mixer; Model 3' x 6'9"; with Sifter.
3474	Stainless Tumbling Batch Mixer; 25" x 5'9" with Motor.
3302	Stainless Tumbling Mixer 5' x 5' with 3 HP motor.
2691	W. & P. type Jacketed Double Arm 100 Gal. working cap. geared both ends; power tilting.

FRED R. FIRSTENBERG, Pres.

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

SURPLUS EQUIPMENT

LATEST TYPE METALLURGICAL AND CHEMICAL EQUIPMENT

Excellent Condition

- Hardinge Conical Ball Mill 10' x 48"
- Vulcan Rotary Kiln 8' dia. x 80'
- Dorr Causticizing Equipment
- Oliver Rotary Vacuum Filters All Iron
- Dorr Type A Thickness
- Sampling Mill—Crusher, Rolls, Samplers
- Link Belt Screw & Belt Conveyors
- Turbo Mixer Agitators
- Norblo & Sly Dust Collectors
- Hardinge Feedometers
- Oliver, Dorr, Morris, Worthington process pumps
- Tanks and Bins
- Instruments and Controls

The above items include all auxiliary equipment with individual motor and control 220/440/3/60. The equipment may be inspected on foundations.

Complete List with Specifications Available.

THE VULCAN DETINNING CO.
SEWAREN, N. J.

ME GO WEST-BUY BEST

2—Vulcan Kilns, 7'6" x 110' 80 HP dr.
Oliver 8' x 10' Precoat Filter
2—Oliver 6' x 8' Precoat Filters
Lehman 3 Roll Mill, 60" x 40" water cooled
Stainless Louisville De-Watering Screen.
2—Rotex #11 Sifters. Single Deck 20" x 48"
Monel Press or Vac. Tank 5'6" dia. x 12'
Sharples PY-14 Super-D-Canter, Stainless
2—Stokes Model 212-B Vacuum Pumps
Multiclone Dust Coll. Size 25-B type 9-VD
Eimco 8' x 8' Rotary Vacuum Filter. Comp.
Swenson 4' x 1' rot. vac. Filter
Hardinge Tube Mill 4' x 10'. Silex lined
Buffovak 2-Effect Evaporator, 5' dia.
120 cu. ft. Double Ribbon Mixer
Rotex Model 52 Screen, 2 deck 60" x 120"
Abbe-Blutergess Turbine Sifter, 3 HP
Worthington 18" x 9" Vacuum Pump
Shriver 30" Filter Press. 29 plts—30 frms.
Sweetland #7 Filter, 41 leaves 2" centers
Rietz RD-18 Disintegrator. 50 HP
Raymond 5 Roller high side Mill. Complete
6' x 12' S.S. Evaporator. Complete
Capem Model SIF. Single head Capper. Ch. pts
Procter-Schwartz Apron Dryer 8' x 90'
Elliott 8" 2 Stage Steam Ejector
New Jersey Pony, Model 86 ML Labeler (4)
Fitzpatrick Model M Mill, Stainless, mtrzd
10—Allis Chalmers 5' x 22' Tube Mills. Line
Hammermill 24" dia. 14" face. 40 HP
Simpson #2—Style VD Muller, 20 HP
Vulcan Briquetting Press, cap. 12 tph
Pfaudler Model XL 1000 Gal Reactor
14' Gayco Mech. Separator. 30 HP

Partial List only—We Buy Your Surplus

MACHINERY AND EQUIPMENT CO.
[illegible] BRYANT STREET SAN FRANCISCO 7, CALIF.

FOR SALE

250 gal. S.S. Tank, 42"x42", agit.
600 gal. S.S. Tank, 54"x60".
100 to 200 gal. S.S. Mix Tanks, water jkt.
3000 gal. S.S. Truck Tanks, Trailerized.
75 gal. Monel Jkt. Kettle, 35"x27", agit.
100 gal. S.S. Clad Jkt. Kettles, 30"x32".
150 gal. S.S. Jkt. Kettle, 42"x34", agit.
300 gal. Pfaudler Horiz. Glass Lined Tank, 25#.
4—50 gal. Steel Kettles, 75# Jkt., A.S.M.E.
Gruendler W. B. Jr. Pulverizer, 10 H.P.
75 to 1500 gal. Homogenizers or Viscolizers.
26" Centrifugal Extractors, copper baskets.
Model 148C Stokes High Vacuum Pump, 1½ H.P.
2" S.S. Centrifugal Pump, 2 H.P.
Hobart Grinder, 1½ H.P.
30 ton Howe Suspension Tank Scale.
2—32"x30" Buffovak Double Drum Dryers.

Send us your inquiries

LESTER KEHOE MACHINERY CORP.
1 East 42nd Street New York 17, N. Y.
MUrray Hill 2-4616

NEW AND GOOD-AS-NEW EQUIPMENT

#316 Stainless Steel Tanks, new, 100, 200 & 360 gal.
1—Stainless Tank #430 Chrome, vert., 7'x10' deep.
20—Jacketed Kettles—Stainless, Copper, Aluminum.
1—J. H. Day Steam Jacketed 50 gal. Sigma Blade Mixer.
1—Copper Evaporator, steam jacketed, 9'1"x3'9".
50—New Pressure Cookers, 18"x18" & 24"x28".
50—Pumps—steam and electric.
1—New Glass Nash Centrifugal Pump, 150 gpm.
1—Jeffroy Vibrating Conveyor 15' lg. 12" wide.
1—Buffovak Jacketed Impregnating Tank 42"x52".
1—4x8 Stortevant Jaw Crusher.
1—Ribbon type Mixer, steam jacketed.
1—Model 16 Sharples Stainless Steel Centrifuge.
3—New Drum Rollers.
1—A. F. Bartlett Hog Mill & 7½ H.P. Motor.
1—Sweetland Filter No. 5—15 leaves.
3—Stainless Steel Jacketed Filters.
2—Plate & Frame Filters 25"—open del.
4—Tanks 100,000 gals. each.
1—Shriver 18" Aluminum Filter 9-plates, 9-frames.
4—Stokes Rotary Tablet Machines RD4.
10—New Sharples Oil Purifiers.

Special:

Mead Mill #2, with 7-½ H.P. totally enclosed motor & Draver Feeder—like new.
Davenport Rotary Steam Tube Dryer 6' x 38' complete with drive—latest model.

H. LOEB & SON :-: 4643 LANCASTER AVE. PHILADELPHIA 31, PA.

FOR SALE

IMMEDIATE SHIPMENT

TUBING *Electrunite Welded*

Heat Exchanger and Condenser Tubing

2" x 13 Gauge x 21'6"—115,000 Ft. 1½" x 16 Gauge x 23'6"—30,000 Ft.

PHONE—WIRE—WRITE

GLAZER STEEL CORPORATION
KNOXVILLE, TENNESSEE PHONE 4-8601

CHEMICAL & PROCESS MACHINERY CORP.
Pledged to Personal Service

UNUSUAL EQUIPMENT

FIRST TIME OFFERED AT EQUALLY UNUSUAL SAVINGS AND WITH our USUAL MONEY-BACK GUARANTEE

A FEW ITEMS FROM our OUTSTANDING STOCK

AUTOCLAVES & STILLS

7—100 gal s/s type 347 autoclaves
2—Pfaudler 500 & 400 gal g/l jktd & agtd reactors
1—F. J. Stokes 500 gal s/s jktd & coiled vacuum still
5—2500 gal steel agitated & coiled vacuum reactors
2—1000 gallon jktd steel vertical autoclaves, 6' x 20' 20 HP XP, 800# internal test
6—4000 gallon steel jacketed and agitated ASME coded autoclaves
3—350 gal s/s autoclaves & chlorinators, one nickel, one very high pressure
1—Devine 1200 gallon jktd & agtd cast iron still
1—New 100 gal lead lined jacketed reactor, made by O. G. Kelly
1—Stokes 160 GPH water still—3 effect
1—200 gal jktd & agit steel autoclave

DRYERS

2—Pittsburgh Electro-dryers Model C-26 and Model CHG, 250 & 350 CFM
5—Beaird Challenger horizontal direct heat driers 4' x 40', 3 gas, 2 oil fired
1—Louisville 4'6" x 25' tubular dryer—complete
1—Jeffrey continuous 3 pass direct heat drier
1—Gahnrich electrically heated single truck drier 6' x 6' x 7'
1—Gruenberg single door electrically heated oven 24" x 24"
1—Stokes 4' x 6' single drum atmospheric drier, steel
1—Devine 3 shelf Model O vacuum shelf drier, 7 sq. ft.
1—9' x 80' rotary kiln—complete—20 HP
2—30" x 30" Buffalo stainless steel drums only

CENTRIFUGALS & FILTERS

1—Sharples Super-D-Canter s/s with 15 HP XP motor
1—Sharples Model LM 4 P1J centrifuge steel bowl
1—Sharples Super centrifuge type MM steel bowl, MD
1—Klein stainless Model 2D filter 96 sq. ft. area—complete
1—Sparkler s/s jktd filter 14D4 with hastalloy plates, NEW
1—NEW Sparkler 14C8 filter with stainless steel plates
1—Eimco 4' x 1' all steel rotary vacuum filter—type L-419
1—Derreo 6' x 3' steel rotary vacuum filter
1—New R. P. Adams s/s 91 sq. ft. filter
2—Sweetland #10 filters, one steel, one with stainless leaves
1—Aluminum 24" filter press, 14 chambers 4 eye, closed
1—Shriver 18" bronze 14 chamber filter press, 4 eye, closed
1—Sperry 24" s/s filter press, 4 eye, closed, 8 chamber
1—Johnson 24" C.I. filter press, 3 eye, closed, 13 chamber
15—Sperry, Shriver, & Independent skeletons—12" to 42"
1—American Tool 32" bottom dump rubber centrifuge, 7½ HP 2 speed
1—Fletcher 40" stainless link suspended centrifuge XP motor
2—30" & 26" rubber covered suspended centrifuges
2—New 42" stainless perforated baskets only, bottom discharge
1—Burkhardt 40 heresite coated lead lined curb centrifuge
1—International 18" rubber covered perforated basket centrifuge
1—International 8" copper perforated basket centrifuge

MILLS & GRINDERS

1—Mikro 2TH steel pulverizer—UNUSED
1—Mikro stainless steel Bantam pulverizer
7—Raymond #0, 00, 1, & type W hammermills
3—Gruendler Model 1, 2816, & #2 hammermills
1—Sprout Waldron attrition mill, 20" with 2—10 HP motors
1—Buffalo #0 hammermill
1—Jeffrey type A hammermill, 10 HP
1—Ball & Jewell #1 rotary cutter, ball bearing, late type
2—Lehmann 9" x 24" high speed 3 roll mills
2—J. H. Day 12" x 32"—3 roll water cooled mills
1—Patterson 6' x 4'—500 gal silex lined pebble mill
1—Hardinge 4' x 14'6" granite lined tube mill—40 HP
2—Allis Chalmers 9" x 36" roller mills—3 pair high
1—NEW Charlotte Model 3 monel colloid mill—3 HP

EVAPORATORS & CONDENSERS

2—300 sq. ft. stainless steel heat exchangers
1—75 sq. ft. stainless steel tubular condenser
1—68 sq. ft. condenser, 1½" x 12' tubes, stainless steel
1—Ross 28 sq. ft. stainless steel condenser
2—Ross 55 sq. ft. stainless steel heat exchangers
1—Tantalum condenser, 3" OD x 72" long
1—Pfaudler 14 sq. ft. glass lined thimble condenser
1—Aluminum tubular condenser, 156 sq. ft. area
1—New lead 66 sq. ft. condenser
1—Devine 45 sq. ft. surface condenser
1—Worthington 1530 sq. ft. size 4, 2 pass copper condenser
3—Pfaudler 150 gal glass lined jktd evaporating dishes
1—Devine all steel double effect evaporator
1—Zahm copper flash type evaporator 500#/hr
1—Swenton quadruple effect steel evaporator, 50,000 lbs per hour of water

MIXERS—ALL TYPES

2—7500 lb. heavy duty dry powder mixers—galvanized
1—Szegvari attritor type B—60 gal with 5 HP motor
40—Lightnin & Alsop portable agitators ¼ to 2 HP—AC & DC
19—Nettco, Philly, Foote Bros. Falk right angle agit drives—2 to 10 HP 16 to 70 RPM
2—Day 80 gal change can mixers
1—Robinson Size 15 continuous 3-5 ton per hour mixer
10—Day 100 to 2000 lb powder mixers
2—Day 10 gal double arm mixers
1—W & P 2¼ gal sigma bladed double arm mixer
2—Hobart 80 quart mixers
2—Patterson 8' & 6' conical blenders
1—Robinson 7000# jktd powder mixer
1—Struthers Wells rotary blender—145 cu. ft. jacketed—stainless
1—Wall Post mixer, 1 HP XP
8—Day & Peerless single & double arm 50 to 300 gal mixers
2—Banbury #9 & 11 mixers
1—Sturtevant powder blender, 1 ton

FILLING EQUIPMENT

1—Automatic liquid line: stainless rotary filler, 4 head Capem capper, Pneumatic Scale labeler, Reddington cartoner, 1 to 16 oz.
2—Colton automatic tube fillers, #17 & 7
4—Knapp & Ferguson shipping case gluers & sealers
1—Stokes & Smith HG automatic powder filler
8—Pneumatic, Ertel, Alsop, & MRM vacuum fillers—3 to 12 spouts
1—Progressive 2 piston monel filler
1—Kari Kiefer visco piston 4 head filler
1—Whiz 4 pocket filler
1—Triangle Electri-Pak filler, Model N2A NEW
1—Hanson stainless hand pack filler
1—M & S 4 pocket filler
1—Elgin stainless 2 piston filler
1—Guyer stainless 6 piston filler

TANKS

7—10,000 gallon all steel storage tanks
8—4000 gallon steel welded storage tanks
2—15,000 gallon steel storage tanks
4—8500 gallon tank car tanks—steel
3—Pfaudler 1000 gallon G/L tanks
4—Pfaudler 500 gallon G/L tanks
4—Stainless steel tanks, 1900, 1400, 1550, 1600 gal
3—500 & 1200 gallon s/s 316 rectangular tanks
2—3000 gal Pfaudler G/L tanks

PUMPS*

3—Labour stainless centrifugal pumps, 1½" x 1½" & 6" x 4"
3—Duriron 1", 1½", 6" x 4" centrifugal pumps
1—Taber stainless 4" x 3" centrifugal pump
3—American hard rubber 2" x 1½" centrifugal pumps
2—Nash 15 & 225 CFM vacuum pumps
2—Beach Russ #1 & 7W vacuum pumps
2—Devine 12" x 12"—196 CFM vac pumps
2—Stokes 100 & 212 CFM vac pumps
* Over 150 pumps: centrifugal, rotary, piston, screw, proportioning, vacuum, diaphragm etc. in our stock—Send for Bulletin 60-P

SIFTERS

1—Rotex #41 sifter, 40" x 10'—single deck
1—Rotex 20" x 84" sifter, single deck
1—Wolfe 20" x 60" sifter, 4 separations—stainless
1—Tyler #38 sifter, 48" x 80"
1—Robinson 32" x 72" sifter—4 separations
1—Schutz-O'Neill 3' x 5' single deck sifter
3—Coombs Gyratory 20" sifters

MONEY-BACK GUARANTEE

YOU MAY PURCHASE THIS EQUIPMENT UNDER OUR "YOURS FOR THE ASKING POLICY." UNDER THIS ARRANGEMENT, YOU WOULD SEND US YOUR ORDER AND CHECK IN FULL, WE WOULD SHIP THE MACHINE SUBJECT TO YOUR INSPECTION FOR A PERIOD OF FIVE DAYS, AND IF AT THE END OF THAT TIME YOU ARE NOT ENTIRELY SATISFIED, YOU MAY RETURN IT FREIGHT PREPAID TO OUR WAREHOUSE, 52—9th STREET, BROOKLYN IN THE SAME CONDITION AS WHEN SHIPPED TO YOU, FOR FULL AND COMPLETE REFUND.

Chemical & Process Machinery Corp.

SEND FOR BULLETIN W

CHEMICAL & PROCESS MACHINERY CORP.
146 GRAND ST., NEW YORK 13, N. Y.
Tel: WOrth 4-8130
FACTORY: 52 9th ST., BROOKLYN 15, N. Y.
Cable Address: "KEMPROCESS"

We Purchase Your Surplus Equipment

FILTER CLOTH
COTTON
40 DIFFERENT CONSTRUCTIONS

FILTER TWILLS, CHAIN CLOTHS AND FLANNELS FOR PLATE AND FRAME PRESSES, DISC FILTERS, ROTARY FILTERS ALL KINDS

SYNTHETIC FILTER FABRICS

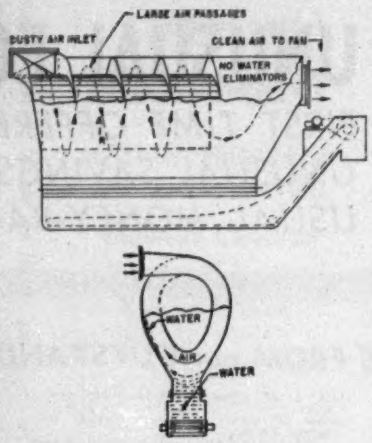
VINYON
ORLON
STANTEX
NYLON

ACID AND ALKALI RESISTANT for CORROSIVE SOLUTIONS
(Nylon alkali-resistant only)

Blankets & press socks fabricated to your inspections
Dust arrestor tubes—all purposes
Write for samples
State width and type of equipment used.

Wm. W. STANLEY Co. Inc.
401 Broadway New York 13, N. Y.

Air Tumbler



NEW, yet tried in hundreds of diversified applications embracing the **MECHANICAL, CHEMICAL,** and **MINING** industries, the **AIR TUMBLER** exploits to the limit the old and proven principle of dust separation by centrifugal action to which it adds **WATER** as a trapping medium. Its **SIMPLICITY, EFFICIENCY, DEPENDABILITY,** and **ECONOMY** have made the **AIR TUMBLER** standard equipment wherever it has been tried.

The AIR TUMBLER is truly THE MASTER OF DUST IN INDUSTRY

For further information write to:

DUST SUPPRESSION & ENGINEERING CO.
P.O. BOX 67, LAKE ORION, MICHIGAN

NOT A SIDE-LINE

VIKING
BUILDS THE FULL LINE IN ROTARY PUMPS

The designing, testing, manufacturing and applying of Viking Rotary pumps is VIKING'S one and only job.

What does this actually mean to you? It means that the energy, the development, and the output are at no time devoted to some other product.

The result is a superior rotary pump in a greater range of sizes and types to really fit your needs better.

Investigate the *complete* Rotary Pump line—VIKING. Start with bulletin 53SC.

See Our Catalog in SWEETS

Viking PUMP COMPANY
Cedar Falls, Iowa

after you've read this magazine

. . . and clipped pertinent ideas, articles and advertisements for reference, *please do not burn or throw it away.*

Here are two sound reasons why:

1) Wastepaper can help to swell the funds of your local Boy Scout Troop, your church or other community organization. It gets a good price these days.

2) Whether in magazine form or not, wastepaper helps to fill the increasing need for paper pulp brought on by the mobilization effort.

Collect it. Give it to your favorite organization. Chances are they have scheduled pick-ups.

SMOOTH — VIBRATIONLESS
PROPELLERS
for MIXING, STIRRING, AERATING, PUMPING, etc.

Manufactured by an exclusive process, MICHIGAN propellers are perfectly balanced to avoid whip and strain on shafts. And because of their superior functioning are now standard parts of the products of many leading equipment manufacturers.

MODEL
GDA - MIXER
BY
INTERNATIONAL ENGINEERING
DAYTON, OHIO

Available for special application and replacement, as well as original equipment, in a wide variety of metals and in sizes up to 60". Write for latest data folder.

MICHIGAN WHEEL CO.
GRAND RAPIDS 3, MICH.

Who's the best source for a Belt Conveyor?

Barber-Greene—
because they are completely standard, and pre-engineered...
that means you save on design costs and erection time!

see your B-G distributor or write
Barber-Greene
AURORA, ILLINOIS U.S.A.

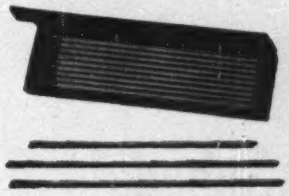
WESTON TAG **Thermometers**

in all forms—ranges—stem lengths—connections

Whether your requirement calls for certified laboratory thermometers . . . or rugged all-metal industrial types . . . or thermometers for remote reading . . . you'll find *exactly* what you require in the Weston-TAG line—*the most comprehensive line of quality thermometers ever offered by ONE manufacturer.* Literature on request. WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey.

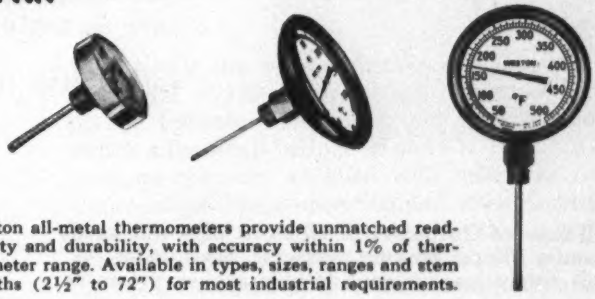
Laboratory

ALL-METAL
—have readable, dial-type scales and corrosion-resisting stainless steel stems—stem lengths from 2" to 24"—ranges from low as −100°F. to high as 1000°F.—accuracy ½ of 1% of thermometer range.



GLASS
—certified sets of ASTM Testing thermometers with overlapping ranges in protective case. Ranges from −36°F. to high as 760°F. Also precision and standard etched stem thermometers for general testing.

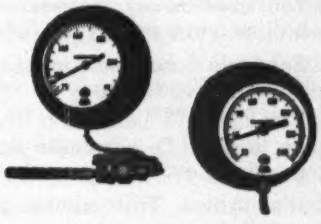
Industrial



Weston all-metal thermometers provide unmatched readability and durability, with accuracy within 1% of thermometer range. Available in types, sizes, ranges and stem lengths (2½" to 72") for most industrial requirements.

Remote Reading

ELECTRICAL
—resistor bulb sensing element permits mounting indicator any distance away from point of measurement. *Multiple* remote readings also possible by use of selector switch and several bulbs.

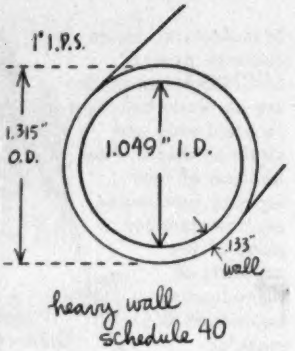


PRESSURE ACTUATED
—for remote reading, in 5, 6 and 8" dial sizes. Ranges from low as −325°F. to high as 1000°F. Accuracy one scale division unaffected by vibration or severe shock. Cases of iron, brass, or plastic.

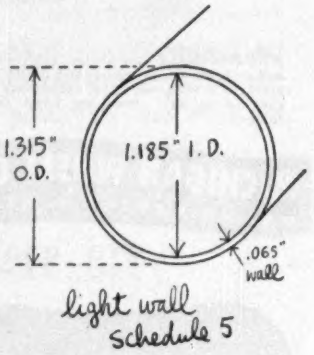
WESTON *Temperature Instruments*
9413
— TO INDICATE — RECORD — CONTROL

Why pay for Schedule 40 pipe where Schedule 5 is more than adequate ?

Back in the days when iron pipe was virtually the only kind available, it was necessary to specify this



But today with the high strength/weight ratio of stainless steel, the great majority of pipeline and process applications will have an ample margin of safety with this



All sizes of Carpenter Schedule 5 pipe will easily handle 150 psi working pressures. Sizes under 1½" will safely handle considerably higher pressures.

By specifying this light wall stainless pipe you gain many advantages:

1. You save money. Schedule 5 pipe costs about half as much per foot as Schedule 40.
2. Schedule 5 has the same O.D. as Schedules 10, 40 and 80—for hook-up with existing lines as well as for new installations.
3. Its larger I.D. increases flow and capacity in pipelines, exchangers and other equipment.
4. It's lighter. This means quicker and easier installation.
5. You can save 10% to 25% on valves, fittings, weld rods, etc., because smaller O.D. material can frequently be used.
6. Fittings are available from several manufacturers . . . and stocks of Schedule 5 pipe are carried by conveniently located Carpenter distributors.
7. Tubing sizes can now be replaced with light wall pipe . . . for ready hook-up with standard valves, pumps, etc.

Light wall Schedule 5 pipe saves dollars—and makes a lot of sense!

For complete data on Carpenter Schedule 5 Stainless Pipe, call your nearest Carpenter distributor or write us direct. We'll be glad to send you the information you need. THE CARPENTER STEEL COMPANY, Alloy Tube Division, Union, N. J.

Export Dept.: The Carpenter Steel Co., Port Washington, N.Y. "CARSTEELCO"

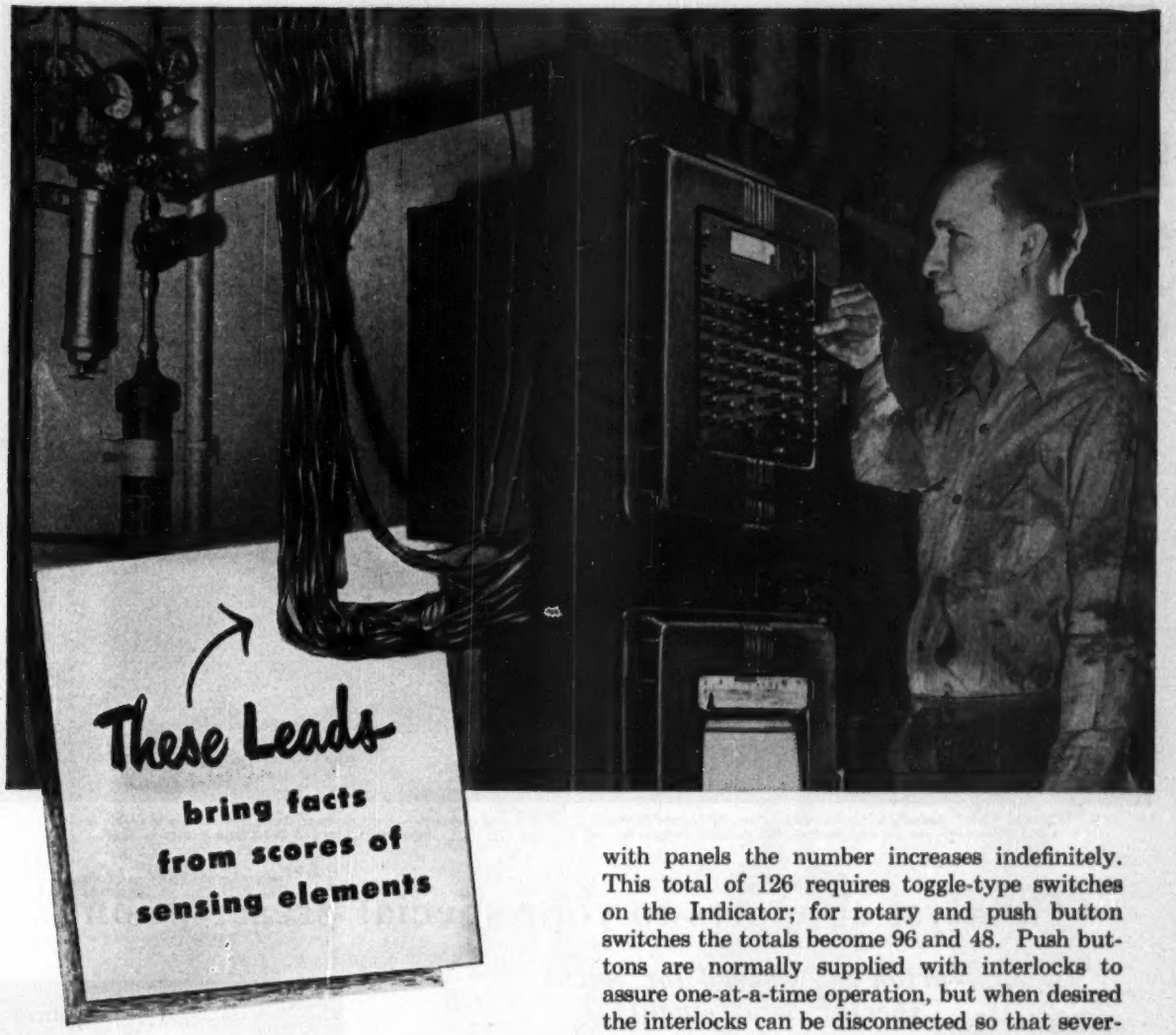
Carpenter

THE U.S. NEEDS YOUR STEEL SCRAP NOW

STAINLESS TUBING & PIPE

Analysis · Tolerance · Finish

- guaranteed on every shipment



Engineers and process operators can save themselves a lot of time and energy in running tests when they use Speedomax Electronic Indicators for "round-up" checks of temperature and other process conditions.

A flick of the finger connects the desired sensing element to the Indicator . . . the instrument's calibrated drum whirls to the reading . . . the drum stops dead still. The entire operation takes only 4½ seconds for consecutive readings at opposite ends of the scale. Minimum time for close-together points is only a fraction of a second. Logging time depends only on the writing speed of the operator.

126 COUPLES ON ONE INDICATOR

As many as 126 thermocouples may be connected to one Indicator without the use of side panels; with panels the number increases indefinitely. This total of 126 requires toggle-type switches on the Indicator; for rotary and push button switches the totals become 96 and 48. Push buttons are normally supplied with interlocks to assure one-at-a-time operation, but when desired the interlocks can be disconnected so that several switches may be closed simultaneously, causing the instrument to give the average of those points.

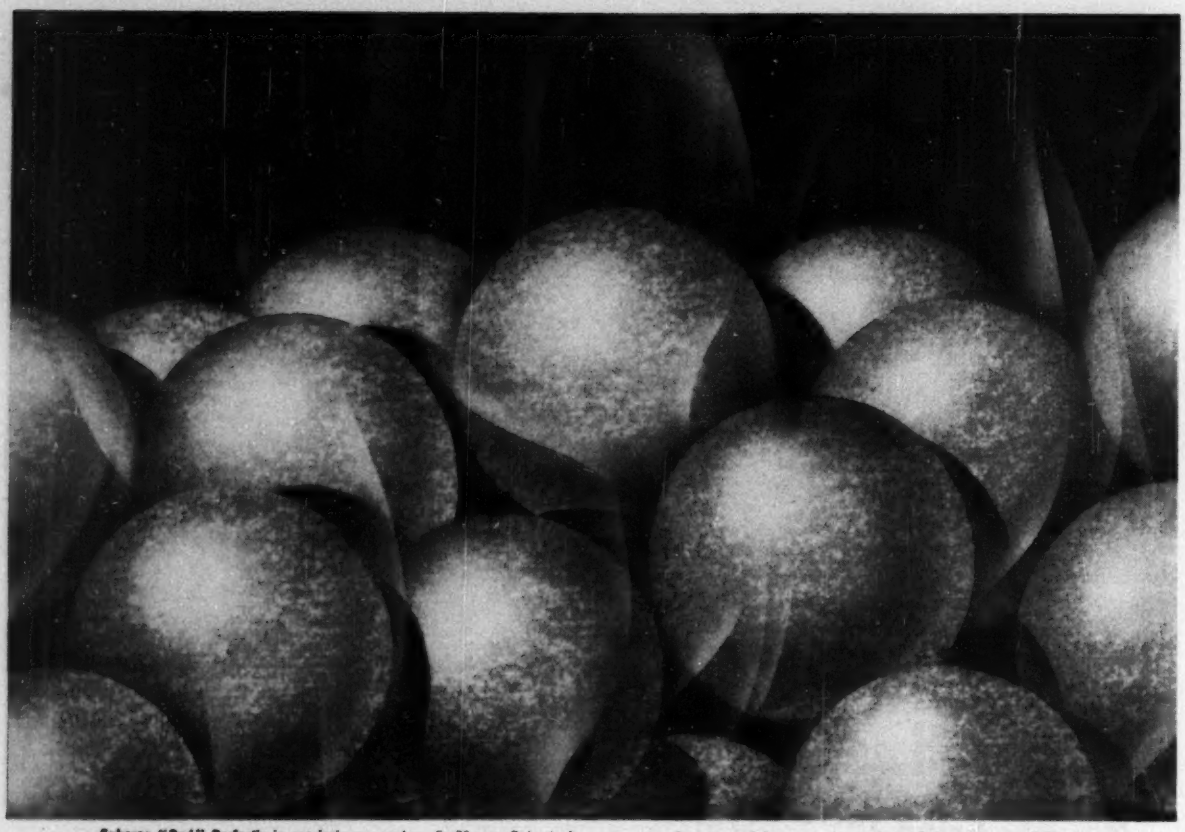
As many as 96 Thermohm electrical resistance thermometers may be connected to the Indicator, using either toggle or rotary switches.

Because the Indicator's scale is not a disc, but the rim or "tread" of a drum-like wheel, the calibration lines are non-radial and hence unusually easy to read. The drum's 25-inch scale has an average of 300 divisions . . . can have 500 if necessary. Enclosed slidewire, and thorough shielding against stray fields, are typical details of high-quality construction.

The equipment is described in our Catalog ND46(1). Whether or not you require this information at present, we will be glad to send a copy for reference. Address our nearest office, or 4916 Stenton Ave., Philadelphia 44, Pa.

LEEDS & NORTHRUP CO.
instruments • automatic controls • furnaces

Jrl. Ad ND46-420(1a)



Spheres "Bed" Perfectly in catalytic processing. In Norton Spherical Catalyst Supports you get uniform beds that promote uniform flow of gases and assure minimum pressure drop. Spheres are available in sizes 3/16" to 1". Supports in Ring and Pellet form in sizes ⅛" to 2".

Catalyst supports to your special prescription

... *Norton engineered for your special requirements*

Where catalyst supports were applicable Norton engineers have been successful in meeting the requirements of a large variety of conditions.

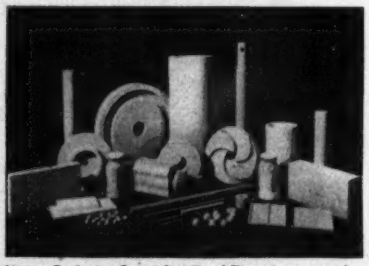
Over 40 years' experience in research and developments of special refractory materials and mixtures have enabled Norton to tailor special refractory mixtures to meet the requirements of the chemical industry.

ALUNDUM* Catalyst Supports are a good example. They have such qualities as great refractoriness, chemical inertness, strength and high resistance to abrasive action. They are made by Norton's exclusive "controlled structure" process. It provides medium porosity of 30-35% with rough open structure for maximum adherence of catalyst, or high porosity 42-47% with large connected internal pores, uniformly dispersed for maximum deposition of the catalyst.

Test them yourself

See what Norton ALUNDUM Catalyst supports can do for you. If you would like to see samples, see your Norton refractories representative or write Norton Company, 501 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



Norton Exclusive Fused Stabilized Zirconia, an amazing material able to take temperatures double the melting point of most metals. No other refractory is so chemically stable at such high temperatures. (Up to 4700° F.) Ask for Bulletin 793.

Norton Exclusive. Norton ALUNDUM *Seamless* Tubes for filtration, aeration, diffusion maintain constant air or liquid pressure. ALUNDUM porous mediums also available in plates, discs and diaphragms. Ask for Bulletin No. 140.

NORTON

Special REFRACTORIES

Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASSACHUSETTS

POWELL VALVES meet all requirements of the CHEMICALS and PROCESS INDUSTRIES

In addition to a complete line in Bronze, Iron and Steel, Powell can supply valves made in the greatest variety of Corrosion-Resisting metals and alloys ever used in making flow control equipment.

The Wm. Powell Company
Cincinnati 22, Ohio

DEPENDABLE VALVES SINCE 1846

Fig. 559—125-pound Iron Body Bronze Mounted Swing Check Valve with flanged ends, bolted flanged cap and regrindable, renewable bronze seat and disc. Disc, when wide open, permits full, unobstructed flow through valve body.

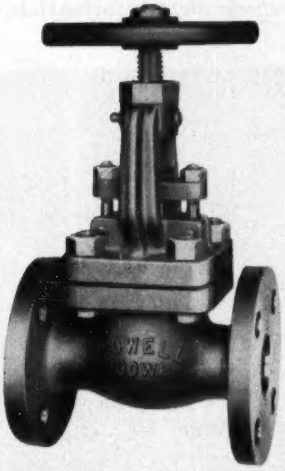


Fig. 2445—Aluminum Globe Valve for 100 pounds W. P. Bolted flanged bonnet, outside screw and yoke. The stainless steel stem is threaded and rises through a bronze bushing in upper yoke. Composition disc. Sizes: ¼" to 3", inclusive. Screwed end valves in this design are also available.

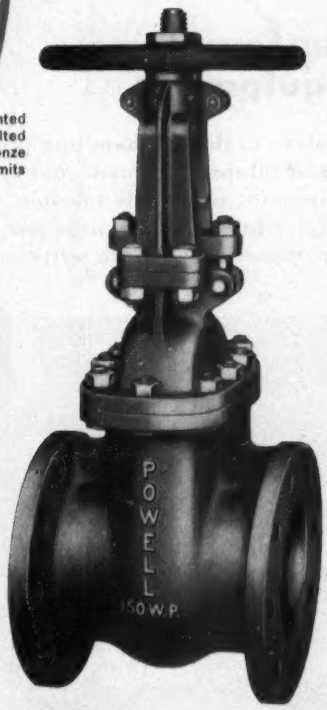


Fig. 2453-G—Large size 150-pound Stainless Steel O. S. & Y. Gate Valve with precision fitted, accurately guided, solid or split wedge. They are interchangeable. Made with separable yoke arms in sizes 5" to 30", incl. Conforms to all the latest standards. Available in a wide selection of other corrosion-resisting metals and alloys.

Fig. 375—200-pound Bronze Gate Valve. Screwed ends, union bonnet, inside screw rising stem and renewable "Powellium" wear-resisting nickel-bronze disc.

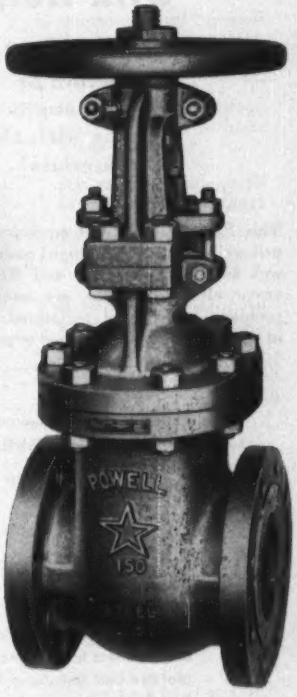


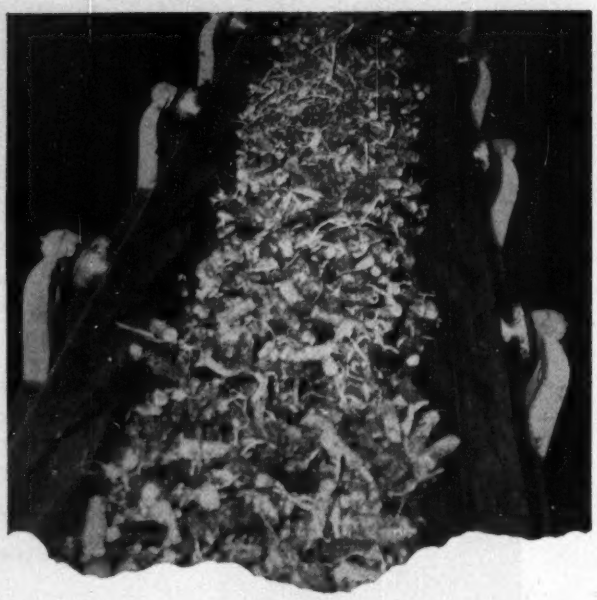
Fig. 1503—150-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

POWELL VALVES

In Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys.

S-A

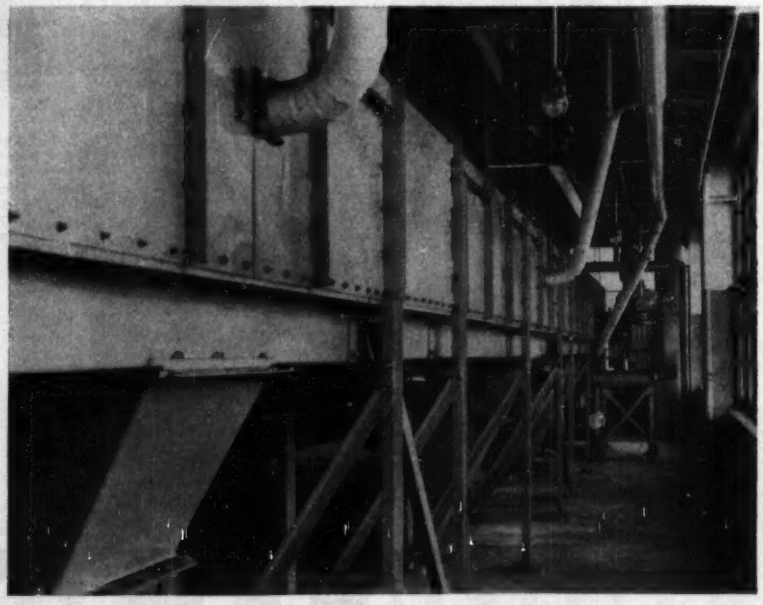
CONVEYING Systems Move CORN COBS



Furfural Industry Utilizes Farm Wastes **with Help of S-A Equipment**

Furfural for the chemical industry . . . the production of synthetic rubber and fabrics. And S-A engineers, with S-A equipment, are helping with the handling of huge volumes of materials! . . . Whatever *your* materials handling problem, you will find S-A equipment and engineering service invaluable in its solution. We are so confident of this that we *urge* you to put your problems before us —to write *now* for complete information.

This S-A designed and equipped system utilizes belt, screw and flight conveyors, as well as bucket elevators and Redler conveyor elevators. Cobs are conveyed to grinders, stored and reclaimed, screened in a rotary screen and carried to processing.



REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Vibrating Conveyors
Belt Conveyors
Screw Conveyors
Bucket Elevators
Pan Conveyors and Feeders
Circular Bin Dischargers
Centrifugal Loaders and Filers
TELLEVEL Bin Level Controls
Ship Loaders and Unloaders
Storage and Reclaiming Systems
Box Car Loaders and Unloaders
Bin Gates, All Types
SEALMASTER Ball Bearing Units

Write for Bulletins on any of the above.

Send at Once for Complete Information

STEPHEN S-A DAMSON MFG. CO.

3 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

"she might have been my kid..."

"There was no time to stop, see? She comes running out from behind this parked car right under my wheels. Her hair is in pigtails, and with the sun shining on it, she might have been *my* kid. We got her to the hospital. It took 3 pints of blood to bring her around. All I have to do is remember the sound of those screaming tires—and I know why *I'm* giving blood."

Yes, all kinds of people give blood—truck drivers, office workers, salesmen. And—for all kinds of reasons. But whatever *your* reason, this you can be sure of: Whether your blood goes to a local hospital, a combat area or for Civil Defense needs—this priceless, painless gift will some day save an American life!

Business Executives!

✓Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed your employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

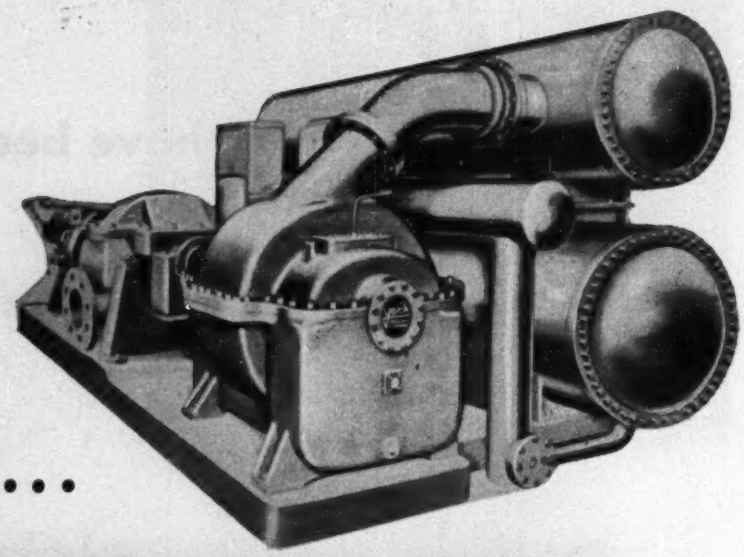
Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

Give Blood Now

CALL YOUR RED CROSS TODAY!

NATIONAL BLOOD PROGRAM

If your refrigeration problem is different...



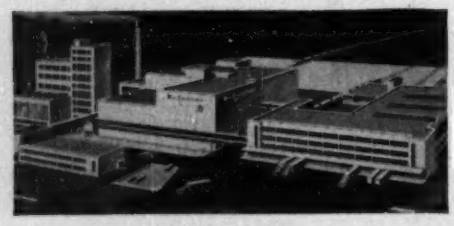
YORK WILL FIND THE ANSWER

Chemical engineers in the brewing field are faced with two basic problems *you* live with every day: Maintain quality—count production costs in fractions of a cent.

Perhaps, in an important cooling process, a saving on horsepower per ton of refrigeration could result in worthwhile economies. It will take real engineering ingenuity, or an unusual application, to make it a reality!

That's when you call in York.

In the case of Anheuser Busch's giant Newark, N. J. plant, this problem was solved by an unusual use of propylene glycol as the coolant . . . which is circulated throughout the brewery's mammoth cooling system. Refrigeration is provided by three huge York Turbo Compressors, totaling 2200 horsepower.



The industry's *widest* range of equipment, 68 years of developments in *mechanical cooling*—this is the winning combination that York offers you!

There is a York Engineering office near you. A consultation incurs no obligation and can lead to increased production, lower costs . . . or both! Call them now. Or write directly to York Corporation, York, Pennsylvania.

YORK TURBO SYSTEMS—Available with steam turbine or synchronous motor for low cost, high performance for industrial and processing manufacturers.

York refrigeration air conditioning

THE BIG ADVANCES COME FROM YORK

HEADQUARTERS FOR MECHANICAL COOLING . . . SINCE 1885

ADVERTISERS INDEX

For more information about products of these advertisers, use Reader Service postcard in section following

Admiral Tool & Die Company.....LB360
Air Preheater Corp.....43
Albert Pipe & Supply Company.....LB320
Allen Bradley Co.....145
Allis Chalmers Mfg. Company....68, 87, 95, 273
Allis-Chalmers Mfg. Co.....433
Allmetal Screw Products Co.....T360
Alloy Steel Products Co., Inc.....341
Aluminum Co. of America.....440
American Air Filter Co., Inc.....281
American Blower Company.....154
American Brass Company.....367
American Car & Foundry.....67
American Hard Rubber Company.....213
American Optical Company.....18
American Platinum Works.....128
American Tool & Machine Co.....136
Ampco Metal, Inc.....44-45
Annin Co.....38
Ansul Chemical Company.....124, T320
Anthracite Equip. Corp.....L417
Atkomatic Solenoid Electric Valves.....L363
Atlas Mineral Products.....280
Atlas Powder Company.....133

Babcock & Wilcox Company.....28-29
Bailey Meter Company.....27
Bakelite Co.....419
Baker & Adamson Products, Gen. Chem. Div. Allied Chem. & Dye Corp.....111
Baker & Company, Inc.....317, 418
Baldwin-Hill Company.....L130
Barber-Greene.....LB457
Barco Mfg. Company.....L358
Barnstead Still & Sterilizer Co.....295
Barrett Div. of Allied Chem. & Dye Corp.....40
Bayley Blower Co.....125
Beckman Instruments Co.....L355
Bemis Bros. Bag.....291
Bersworth Chemical Company.....288
Bethlehem Steel Co.....47
Bird Machine Company.....11
Black, Sivalls & Bryson, Inc.....41
Blaw-Knox Const. Company.....106-107
Bridgeport Brass Company.....420
Brookfield Eng. Labs., Inc.....LT395
Brown & Root, Inc.....117
Buffalo Forge Co.....73
Buffalo Meter Company.....R363
Buffalo Pumps, Inc.....14
Buflovak Eqpt. Div. Blaw-Knox.....396

Cambridge Wire Cloth Company.....R355
Carbide & Carbon Chemical Co. Div. Union Carbide & Carbon.....233
Carborundum Co., The.....389
Carpenter Steel Company.....347, 458
Cash, A. W. Co.....239
Century Electric Company.....80
Chain Belt Co.....30
Chapman Valve Mfg. Company.....301
Chase Bag Co.....394
Chemical Const. Corp.....37
The Chemical & Industrial Corp.....72
Chem. Steel Const. Company.....443
Chicago Bridge & Iron Company.....10
Clark Bros. Company.....217
Clark Equip.Co.....132
Cleaver-Brooks Company.....77
Cleveland Worm & Gear Company.....109
Commercial Solvents Corporation.....235
Cooper Alloy, The.....75
Copper-Bessemer Corp.....153
Coppus Engrg. Corporation.....34
Corning Glass Works.....150-151
C-O-Two Fire Equipment Company.....42
Crane Company.....245
Crane Packing Company.....334
Crouse-Hinds Company.....304-305
Crucible Steel of America.....410
Cyclotherm Steam Generators.....224

Dampney Company, The.....319
Darco Dept. Atlas Powder Co.....375
Darling Valve & Mfg. Co.....48
Darnell Corporation, Ltd.....L353

ADVERTISING STAFF

Sales Manager.....**B. E. Sawyer**
Business Manager.....**A. E. Weis**

Sales Representatives

Atlanta.....**R. C. Maultsby**
Boston.....**W. D. Boyd**
Chicago.....**L. A. Cunningham**
Chicago.....**J. M. Rodgers, Jr.**
Cleveland.....**D. G. Sawyer**
Dallas.....**J. H. Cash**
Los Angeles.....**J. H. Allen**
New York.....**R. G. Frederick**
New York.....**J. E. Tuohig**
Philadelphia.....**E. M. Schellenger**
Pittsburgh.....**D. A. Facka**
San Francisco.....**Ralph Dorland**

Davenport Machine & Fdry. Co.....T314
Davison Chemical Corporation, The.....397
DeLaval Separator Co.....127
Delaval Steam Turrine Co.....297
Dings Magnetic Separator Co.....L424
Dodge Mfg. Corporation.....81
Dorr Company.....139
Dow Chemical Company.....390
Dowell, Incorporated.....219
Downington Iron Works, Inc.....152
Dracco Corporation.....123
Duraloy Company.....R417
Durametallic Corp.....B310
Duriron Company, Inc.....267
Dust Suppression & Eng. Co.....M456

Eastman-Kodak-Co.....79
Electric Auto-Lite Company.....T259
Electro Chemical Engineering Mfg.....L436
Electro-Refractories Abrasives Corp.....B308
Elliott Company.....24-25
Enjay Company, Inc.....401
Eriez Mfg. Co.....141
Ethylene Chemical Corporation.....L422
Ever-Tite Coupling Co. Inc.....335

Fansteel Metallurgical Corp.....318
Farrell Birmingham Company, Inc.....225
Fenwal, Incorporated.....262
Filtration Engineers, Inc.....51
Filtrol Corp.....R422
Fischer & Porter Co.....49
Fletcher Work.....B312
Flexitallic Gasket Company.....244
Flexonics Corp.....321
Fluor Corp.....59
Foote Bros. Gear & Machine Corp.....55
Foster Engineering Company.....L400
Foster Wheeler Corporation.....345
Benjamin Foster Co.....296
Foxboro Company, The.....62
Friez Inst. Div. of Bendix Avia. Corp.....B314
Fruehauf Trailer Co.....85
Fuller Company.....74

General Amer. Transp. Corp....84, 119, 211, 249
General Electric Company.....146-147, 393
Gifford Wood Company.....31
Girdler Corp.....2nd cover
Globe Steel Tubes Company.....227
Glycerine Producers Assoc.....406
Golden Anderson Valves Co.....323
Goodrich Company, The B. F.....15
Goodrich Chemical Co.....17
Goslin-Birmingham Mfg. Co. Inc.....315
Gotham Instruments.....83
Goulds Pumps, Inc.....425
J. W. Greer Company.....R399
Grinnell Company, Inc.....8
Groen Mfg. Co.....LTB302

Hammond Bag & Paper.....T222
Hapman Conveyors Inc.....351
Hardinge Company, The.....348
Harshaw Chemical Co.....20
Hartwell & Sons, Inc., H. N.....271
John Hassall, Incorporated.....LT427
Haynes Stellite Company.....269
Henszey Company.....T312
Helicoid Gage Div. Amer. Chain & Cable Company.....294
Hewitt-Robins.....356-357
Hills-McCanna Company.....362
Hooker Electrochemical Company.....408
Horn Co. Inc., A. C.....63
Hough Company, Frank.....415
Hudson Pulp & Paper Corp.....71

Illinois Testing Labs. Inc.....R436
Illinois Water Treatment Co.....46
Industrial Process Engineers.....39
Ingersoll-Rand.....386
Insul-Mastic Corporation.....105
International Engrg. Inc.....142
International Nickel Company.....65
I.T.E. Circuit Breaker Company.....412-413

Jefferson Chemical Company, Inc.....392
Jeffrey Mfg. Co.....275
Jelliff Mfg. Company.....T324
Jenkins Bros.....76
Jerguson Gage & Valve Corp.....346
Johns-Manville.....78, 231, 326
Joy Mfg. Company.....223

Kalamazoo Tank & Silo Company.....T335
Keasbey & Mattison Company.....82
Kemp Mfg. Company, C.....86
Kewanee-Ross Corp.....97
Key Co.....385
Kidde & Company, Walter.....232
Kimberly-Clark Corporation.....36
Kold-Hold Mfg. Company.....137
Koppers Company, Inc.....50, 155
Koven & Bros. Inc.....423
Kinney Mfg. Co.....263

LaBour Company.....53
Ladish Co.....35
Lapp Insulator Company.....215, 311
Lawrence Mach. & Pump Corp.....327
Lebanon Steel Foundry.....236
Leeds & Northrup Company.....459
Leslie Company.....435
Link-Belt Company.....13, 101, 131
Liquidometer Corporation.....B342
Arthur D. Little, Inc.....261
Louisville Dryer Div. of Gen. Amer. Transp. Corp.....119
Lubriplate Div. Fiske Brothers Refining Co.....R432

Maas Chemical Co., A. R.....89
Magna Mfg. Co.....443
Manheim Mfg. Co.....90

Manning, Maxwell & Moore, Inc..... 56
Marley Company, Inc. The..... 9
Master Elec. Company.....3rd cover
McGraw-Hill Book Co.....R427
McQuay Inc. 32-33
Mehl Mfg. Co.....T310
Merrick Scale Mfg. Co..... 443
Metal Textile Corporation..... 290
McDanel Refracture Porcelain..... 358
Meyercord Co. LB427
Michigan Wheel Company.....LT457
Michigan Pipe Company..... 344
Midwest Piping & Supply Co..... 409
Miller, Ray LT443
Minneapolis-Honeywell Regulator Company Industrial Division.....52, 382, 383
Mixing Equipment Company, Inc..... 207
Monarch Mfg. Works, Inc.....L428
Monsanto Chemical Company.....60-61
Moore Products Co..... 221
A. B. Murray Company.....R400

Nash Engrg. Company..... 313
Natl. Airoil Burner Company.....R388
National Aluminate Corporation.....L387
Natl. Carbon Div. Union Carbide & Carbon Corporation 282-283
Natl. Engrg. Company.....22-23
National Filter Media Corp.....L432
New England Tank & Tower Co..... 328
Niagara Alkali Company..... 253
Niagara Blower Co..... 330
Nicholson & Company, W. H.....B222
The H. W. North Co..... 144
Norton Company 460

Oldbury Electro-Chem. Company.....T308
Ohio Injector Co..... 380
Ohrmart Co. L443
The Oilgear Co..... 26
Oliver United Filters, Inc..... 92
Omega Machine Company..... 416
Oronite Chemical Co..... 238

Pangborn Corp. 300
Patterson-Kelly Company 414
Penfield Mfg. Company, Inc.....B322
The Perkin-Elmer Corporation..... 349
Permutit Company, The..... 285
Petro-Chem Development Co. Inc..... 121
Pfaudler Company .....277, 4th Cover
Pfizer & Company, Inc., Chas..... 309
Philadelphia Gear Works, Inc..... 438
Pittsburgh Agricultural Chemical Co. Div. of Pitts. Coke & Chem. Co..... 405
Pitts. Corning Corp..... 293
Pittsburgh Lectrodryer Corp..... 58
Pneumatic Scale Corp. Ltd.....R424
Posey Iron Works..... 384
Potter Aeronautical Co..... 292
Powell Company, Wm.....439, 461
Prater Pulverizer Company..... 331
Pressed Steel Tank Co..... 94
Proctor & Schwartz, Inc.....R395
Process Controls Div. of Baird Ass..... 122
Process Div. Gen. Amer. Transp. Corp... 84
Prufcoat Laboratories, Inc..... 278

Quaker Oats Company..... 352

Raybestos Manhattan Inc. Manhattan Rubber Div. 434
Raybestos-Manhattan Inc. Raymond Pulverizer Div., Combustion Engrg. Company 246
Reading Pratt & Cady..... 129
Reeves Pulley Co.....L399
Reichhold Chemicals, Inc..... 115
Reliance Electric & Eng. Co..... 279
Republic Flow Meters Co..... 64
Republic Steel Corporation..... 135
Revere Copper & Brass, Inc..... 365
Reynolds Metals Co..... 54
Rodney-Hunt Machine Co..... 431

Roosevelt Oil & Refining Corp..... 265
Roots-Connersville Blower Corp..... 377
Geo. D. Roper..... 256
Ryerson & Son, Inc., J. T..... 156

Sandvik Steel, Inc..... 303
Saran Lined Pipe Company..... 234
Sarco Company, Inc..... 379
Sauereisen Cements Co..... 443
Schmieg Industries, Inc.....T322
Schneible Company, Claude B.....B324
Schutte & Koeting Company..... 12
Shriver & Company, T.....RT353
Sierbath Gear & Pump Co. Inc..... 336
Simpson Mix-Muller Div. of National Eng. Company 22-23
Sivyer Steel Casting Company..... 57
W. W. Sly Mfg. Company..... 371
A. O. Smith Corporation..... 381
Solvay Process Div., Allied Chem. & Dye Corporation 237
Sparkler Mfg. Company.....250-251
Spence Eng. Company, Inc..... 333
Spencer Turbine Co., The..... 258
Spraying Systems Co.....RB353
Sprout Waldron & Company.....372-373
Standard Oil Company, Indiana..... 96
Standard Steel Corporation..... 66
W. W. Stanley, Inc.....LT456
Stephens Adamson Mfg. Company..... 462
Stokes Machine Company, F. J..... 366
Stone & Webster Engrg. Corp..... 407
Streeter-Amet Co. LB395
Struther Wells Corporation..... 398
Sturtevant Mill Company..... 337
Sun Shipbuilding & Dry Dock Co..... 98
Superior Combustion Ind. Inc.....T342
Surface Comb. Corp..... 354
Swenson Evaporator Company..... 6-7

Taber Pump Company..... 350
Tank Storage Terminals Div. of Gen. Amer. Transp. Corp..... 249
Taylor Forge & Pipe Works..... 421
Taylor Instrument Companies.....148-149
Texas Gulf Sulphur Company, Inc..... 325
Thomas Alabama Kaolin Co..... 332
Titeflex, Incorporated RT387
Trane Company 463
Traylor Engrg. & Mfg. Company..... 19
Trent Tube Co..... 404
Trerice, H. O..... 226
Tri-Clover Machine Co..... 99
Tube Turns, Inc.....441-442
Turbo Mixer Div. of Gen. Amer. Transp. Corporation 211
Turner & Haws Eng. Co. Inc..... 343

Union Bag & Paper Corporation..... 21
Union Carbide & Carbon Corp. Carbide & Carbon Division..... 233
Union Special Machine Co.....T302
U. S. Gasket Company..... 286
U. S. Industrial Chemical Co.....69-70
U. S. Instrument Co.....RB428
U. S. Rubber Company..... 411
United States Steel Co., Oil Well Supply Div. 100
U. S. Stoneware Company..... 102

Van Dorn Iron Works Co..... 287
Victory Eng. Corp..... 370
Viking Pump. Co.....LB456
Virginia Carolina Chem. Corp..... 437
Vogt Machine Company, Henry..... 255

Wagner Electric Corp..... 16
Wall Colmonoy Corp..... 218
Walworth Company 299
Warren Steam Pump Company, Inc.... 338
Watson-Stillman 426
Welding Fittings Corporation..... 306
Welsbach Corporation 430
Western Electrochemical Co..... 259
Western Supply Company..... 120
Westinghouse Electric Corp. Sturtevant Div. 339
Westinghouse Electric Corp.....91, 289, 402-403
Weston Elec. Inst. Company.....429, R457
Wilfley & Sons, Inc., A. R..... 257
Wilson Inc., Thomas C..... 260
Williams & Company, C. K..... 140
Williams Patent Crusher & Pulverizer Company 88
Wolverine Tube Div. of Calumet & Copper Company 391
Worklon, Incorporated RT443
Worthington Corp. 329, 361, 429

Yarnell-Waring Company 93
York Co. 464
Young Radiator Co.....R388

PROFESSIONAL SERVICES 444

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 445, 446
Positions Wanted 446
Selling Opportunities Wanted..... 446
Employment Agencies 445
Employment Serives 445

SPECIAL SERVICES 446

BUSINESS OPPORTUNITIES
Offered 446

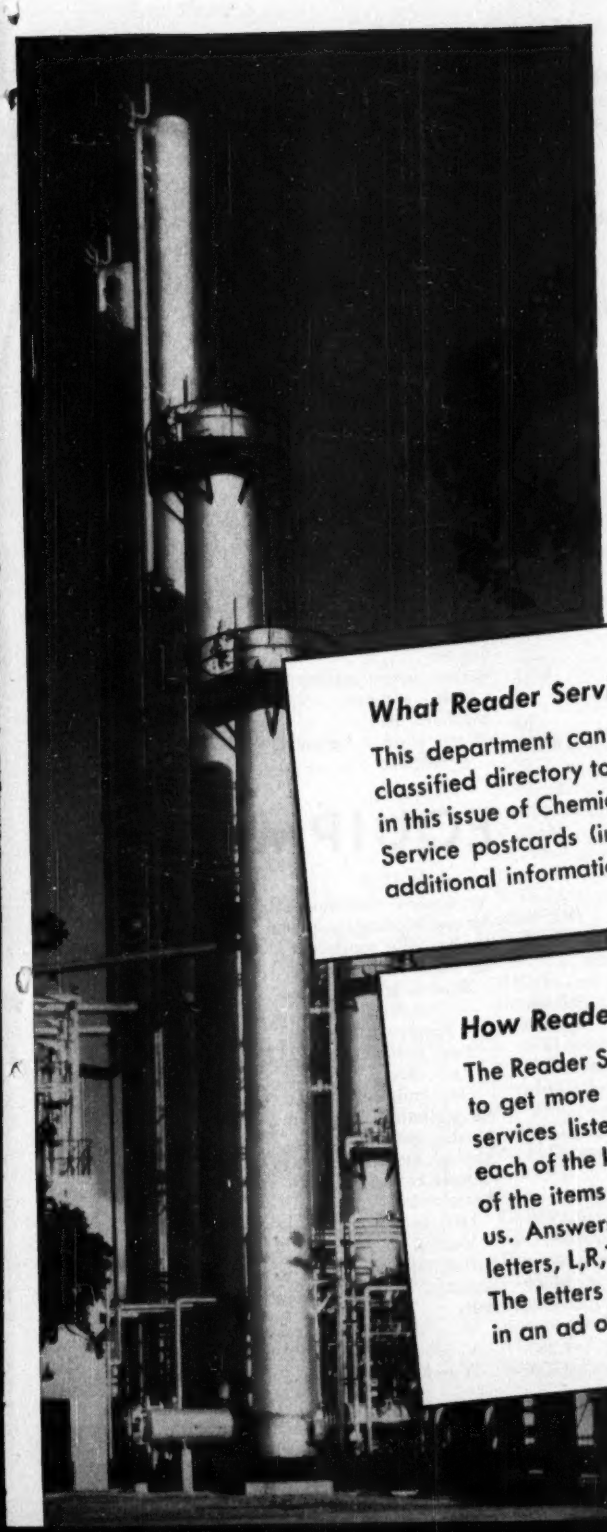
PROPERTY
Wanted 446

EQUIPMENT
(Used or Surplus New)
For Sale 446-455

WANTED
Equipment 446
Miscellaneous 446

ADVERTISERS INDEX
Aaron Equipment Co..... 452
Allied Chemical & Dye Corp., Solvay Process Div..... 446
Barcan Co., Irving..... 452
Brill Equipment Co..... 451
Chemical & Process Machinery Corp. 455
Chemical Service Corp..... 446
Consolidated Products Co., Inc.... 447
Drake Personnel Inc..... 445
Edwards Steel Drum..... 446
Electric Equipment Co..... 452
Equipment Clearing House Inc.... 452
Eveready Supply Co., The..... 446
First Machinery Corp..... 454
Freeland Products Co..... 446
Gale, C. J..... 446
Gelb & Sons Inc., R..... 449
Glazier Steel Corp..... 454
Heat & Power Co., Inc..... 450
Kehoe Machinery Corp..... 454
Land Inc., L. J..... 450
Lawler Machinery Corp..... 450
Lestan Corp. 452
Loeb Equipment Supply Co..... 448
Loeb & Son, H..... 454
Luria Steel & Trading Corp., Erman-Howell Division 450
Machinery & Equipment Co. (Calif.) 454
Machinery & Equipment Co. (NYC) 452
Marvin Co., George R..... 452
Olin Industries Inc..... 445
O'Neill, A. J..... 448
Pacific Processing Corp..... 446
Perry Equipment Corp..... 453
Perry Products Co..... 452
Ripley's Inc. 446
Sabin Metal Corp..... 450
Selective Placement 445
Stanhope 450
Stein Equipment Co..... 452
Strickler & Assoc., Dean C..... 448
Truland Chemical & Engineering Co. 446
Union Standard Equipment Co.... 448
Vulcan Detinning Co., The..... 454
Weinstein Co. 446

Chemical Engineering Reader Service



- **CHEMICALS**
- **EQUIPMENT**
- **SERVICES**

What Reader Service Does for You...

This department can serve you in two ways. It is a complete classified directory to equipment, chemicals and services offered in this issue of Chemical Engineering. It is also a key to the Reader Service postcards (inside back cover) that will bring you free additional information on any of the listed items.

How Reader Service Works...

The Reader Service postcards inside the back cover make it easy to get more information on any of the chemicals, equipment or services listed here. Each card has corresponding numbers for each of the key page numbers in this directory. Circle the numbers of the items you want; fill out the return address; mail the card to us. Answers will come direct to you from the companies. The letters, L,R,T,B, locate ads on the page: left, right, top, bottom. The letters a,b,c and A,B,C indicate first, second, third, etc., item in an ad or on a particular page.

Chemical Engineering Reader Service

CHEMICALS–EQUIPMENT–SERVICES

What Reader Service Does for You

This department can serve you in two ways. It is a complete classified directory to equipment, chemicals and services offered in this issue of Chemical Engineering. It is also a key to the Reader Service postcard (inside back cover) that will bring you free additional information on any of the listed items.

How Reader Service Works

The Reader Service postcard inside the back cover makes it easy to get more information on any of the chemicals, equipment or services listed here. The card has corresponding numbers for each of the key page numbers in this directory. Circle the numbers of the items you want; fill out the return address; mail the card to us. Answers will come direct to you from the companies. The letters, L, R, T, B, locate ads on the page: left, right, top, bottom. The letters a, b, c and A, B, C indicate first, second, third, etc., item in an ad or on a particular page.

CHEMICALS

Activated carbon 375a
Additives, fuel oil, santolene H.... 60-61c
Adhesives, for metals and non metals. 229A
Adsorbents R422b
Agricultural frit 228A
Alkalies 237
Alkyl phosphites 437
Alumina, activated 440
Aniline 350B
Butyls, & butyl derivatives..... 235
Carbon black 354L
Catalyst 236B, R422a
Catalysts
  Chloro-acetamide 234B
  Platinum metals 418
Carbonate of potash..... 253
Caustic soda 408
Chelating agents, versenes..... 288
Chlorates B259a
Chlorosulfonic acid 60-61B
Coal chemicals 405
Coal-tar chemicals 40
Coatings
  Enamel, white, fume resistant..... 63
  Porcelain enamel 229B
  Primer, for vinyl coatings, bulletin 015 278
  Protective 319, 352Q
  Protective
    Coal-tar pitch base..... 155
    Insul-mastic 105
    Resins, vinylite 419
  Resin 232A
  Resin, for nuts & bolts..... 17
  Weather coating, asphalt emulsion, fibered 296
Colors, chemical 115b
Dibutyl adipate 350G
Electro-chemicals T308
Ethanolamines 350C
Ethylene dichloride 392
Ethylbenzene 352R
Filter aids, powders 231
Fuel additive 234A
Fumaric acid 309
Fungicide 230B, 350F
Furfuryl alcohol 352
Glycerine 115d
Glycerine, for use in drugs & cosmetics. 406
Glycols 350M
Hydrogen peroxide 352F
Industrial & laboratory..... 20
Insulation
  Fiber glass 234C
  Vermiculite 230D
Kaolin, kaolinitic, collodial..... 332
Lubricants 354I
Lubricants
  Grease 96
  Oil 229C, R432
Maleic anhydride 115f
Metallic-sodium 69-70
Methyl salicylate 60-61b
Nitrogen compounds 348N
Oxo-alcohols 401
Ozones 430b
Paint 352D
Perchlorates B259b
Phenol 115c, 350R
Phenol, properties, uses & handling booklet 390
Phosphates 60-61e
Phosphorus, elemental 60-61d
Phthalic anhydride 115e
Pigments, technical selection reports..140
Plasticizers, DOP 60-61a
Polyols, sorbitol 133
Polystyrene, modified..... 236A
Potassium titanium fluoride 111
Primaquine 236C
Raw materials, for synthetic detergents, alkane 238
Reagents 352C
Reagents
  For flotation 348O
  Rare 350O
Resins
  Anion exchange L387
  For gum formula 352A
  Phenol 60-61g
  Synthetic 115a
Rubber, natural malaya 354D
Silicas, fine sized 397b
Silicofluorides, organic 397a
Sodium phosphates 89
Sodium sulfate 115g
Sodium sulfite 115h
Solvents, glycol-ether 233
Solvents, napthas 265
Soybean meal 236D
Stearates 350N
Sulphur 325
Surface active agents, polydroxyamine 230C
Synthetic fiber 230A
Water purifiers, granular, hydrodarco 375b

EQUIPMENT

Absorbers, HCL 282-283j
Air cleaners, electronic, catalog 600... 339
Air conditioning equipment..... 32-33b
Air handling equipment..... 125
Air handling equipment
  Blowers & exhausters
    Centrifugal 377a
    Rotary positive 377b
  Fans, fume, bulletin 2424-E..... 73
  Fans, sirocco 154
  Gas scrubbers, bulletin 4-RA..... 12
Air preheater, ljungstrom..... 43
Anodes, ground 282-283f
Apparel, industrial, orlon..... TR443
Autoclaves 350E
Autoclaves
  Horizontal 106-107d
  Vertical 106-107f
Battery caps 216D
Bearings, "SC" 81
Belts
  V 90
  V, grommet 15
  Wire mesh R355

Belt idlers 30
Bins, storage, glazed tile T335
Boiler plants, steam 352S
Boilers, steam 77
Burners
  Gas, industrial 354
  Oil and gas 208A
  Oil, dual stage L388
Calculating device, graphical, for carbon dosage determination 375c
Calendering systems, for plastic film and coatings 225
Casters and wheels L353
Castings
  High alloy R417
  Stainless steel, centrifugal 236
  Steel 57
Catalyst supports, spherical 460
Centrifugals 136, B312
Centrifuges 127
Chain, hook and bar 354H
Classifiers, crystal 396b
Columns, fractionating or stripping, alloy 277b
Combustion chambers, HCl 282-283i
Communication equipment, hand sets, explosion-proof BR428
Compressors 348L
Compressors
  Gas-engine-driven 217
  Heavy duty, single stage 223
  Horizontal air, bulletin L-675-BIB ..329
  Power driven 153
Containers
  Bags
    Multiwall 21, T222
    Multiwall, all-crinkled 394
    Waterproof, laminated, textile ...291
  Cylinders, compressed gas 94
  Drums, aluminum 54
  Sacks, multiwall 71
Controlled humidity air conditioning method 330
Control panels 350A
Conveying systems, pneumatic 74
Conveyor 352J
Conveyor sections, pressure and vacuum 351c
Conveyors
  Belt BL457
  Cable 351b
  Chain, sealed pin 351a
  Elevator, roundabout tray 31
  Multi-tier R399
  Pneumatic, bulletin 529 123
  Screw 13
  Steel belt 303
  Vibrating 275e
Coolers
  Atmospheric 119c
  Cascade, glass, Pyrex 150-151b
  Cascade, impervious graphite ..282-283a
  One, two or three circuit, catalog No. 101 414
  Surface 119a
  Vibrating 275d
  Water tube 119b
Cooling towers 345
Coupler
  Fluids lines 214A
  Large liquid line 212B
Couplings 350L
Couplings
  Bronze B335
  Flexible, teflon, bulletin FC-952 ..286b
Decals, industrial B427
Delvulcanizers, bulletin 2403 ..... 106-107a
Diesels, small 354G
Digesters
  Sulphate 106-107b
  Tumbling 106-107e
Disintegration equipment
  Crushers, rotary fine 337
  Mills
    Ball 142d
    Colloid B360
    Hammer 88a
    Hammer, helix-seal 88b
    Roller, with air separation 88c
  Size reduction machines 372, 373
Drives
  Chain 101
  Fluid 131
  Variable speed L399
  Worm gear, bulletin HGB 55
Dryers
  Air 58
  Rotary, bulletin 524 66
  Spray 6-7
  Vibrating 275b
Drying Systems, Engineering-Machinery R395
Dust & fume collectors
  Centrifugal T322
  Centrifugal, bulletin 551 ..... B324
Dust collectors
  Centrifugal R456
  Filter, bulletin 909A 300
  Filters 371
  Reverse air jet cleaning 343
  Wet 281
Dust control 348B
Dust control, powder fillers 348I
Evaporators 396a
Evaporators, one pass, continuous process 431
Exchangers, lube oil, bulletin 1.1K5 97
Expansion joints, teflon, bulletin FC-952 ..... 286a
Fabrication equipment, automatic ...144c
Fabricators
  Contract manufacture and assembling 315
  General steel plate construction ...384b
  Heat exchangers 152b
  Pressure vessels 47
  Process equipment 352O, 398, 423
  Shop, piping 8
  Steel and alloy plate 152a
  Tanks, storage 384a
  Wire mesh products T324
Feeders
  Belt 210B
  Chemical solution, dry materials ...416
  For non-free flowing materials 348E
  Rotary, airlock 331
  Vibrating 275a
File cards, mechanized 354Q
Filling equipment, vacuum R424
Filter cloth, chemical, dynel L432
Filter cloth, cotton & synthetic fabrics T456
Filter units, pressure 144b
Filters 352I
Filters
  Centrifugal 11
  Construction & application data ..R387
  Horizontal plate 250-251
  Panel, convertible 92
  Rapid sand, automatic backwash ...348
  Rotary drum vacuum 84b
  Rotary leaf pressure 84a
  Rotary vacuum, string discharge 51
Firebrick, vermiculite 209B
Fire extinguishers
  Dry chemical 124, T320
  Portable 232
Fire extinguishing systems, low pressure carbon dioxide 42
Fittings & fasteners, stainless steel ..T360
Fittings & flanges, welding 441-442
Fittings
  Cast iron 352E
  Flanges, pipe, welding 385
  Forged, stainless steel, bulletin S-1 and S-2 426
  Pipe 35
  Pipe, polyvinyl chloride 271
  Welding
    Corrosion-resistant 306
    Seamless 227
Flash drying systems, catalog 54A 246
Furnaces, iso-flow 121
Gaskets, metallic, Goetze, catalog PK-35A 78
Gaskets, spiral wound 244
Gear reducers 348Q
Gear, worm, bulletin 400 109
Generators
  Inert gas 377d
  Inert gas, bulletin 110 86
  Steam, catalog 322 ..... T342
Glassware, plant equipment, pryex 150-151c
Heat exchangers 120
Heat exchangers
  Scraped surface, bulletin PE-1 255
  Shell-and-tube R388, 282-283b
Heat transfer apparatus 2
Heat transfer equipment 32-33a
Heat transfer equipment, platecoils, bulletin P61 137
Heaters 354B
Heaters, oil 348H
Hortonspheres 10
Hose
  Flexible metal 321
  Rubber, bulletin 6879 434
Instruments
  Analysis cells 370b
  Analyzers, plant stream, bulletin 36..122
  Controllers
    Flow ratio 49
    Force-balance pneumatic ...148-149d
    Indicating, bulletin 362 62
    Temperature, electronic R436
  Controls
    For smoke prevention 27
    Indicating 226g
    Liquid level 354N
    Motor 145
    Non-indicating 226h
    Recording 226f
    Self-operating 226e
    Temperature, catalog 400 262
    Time-cycle 352L
  Density gage 348C
  Electronic, in product-analysis systems, bulletin 15-14 382-383
  Electronic truck scales 224A
  Flash point tester 220A
  Flowmeter 224B
  Flow metering systems 292
  For analysis 352P
For radiation protection 354O
Gages
  Liquid level, remote reading 346
  Liquid, tank B342
  Pressure 226b
  Pressure & vacuum 294

Indicating, thermometers 226a
Indicators
Dial 148-149e
Electronic 459
Temperature T259
Receiving flow 148-149g
Mass, spectrometer 354A
Measuring 352G
Measurement and control
General line 348F
Liquids and gases 348P
Meters
Feed water T312
Positive displacement 377e
Stainless steel R363
Optical pyrometer 226B
Pneumatic positioning 354K
Pressure transmitter 226A
Recorder-controller, elapsed time...83
Recorders, chart 148-149f
Recording
Gages 226d
Thermometers 226c
Regulators
Pressure, bulletin 2403.....221
Temperature, bulletin 464.....435
Resistors, temperature B314
Spectrometers 349
Thermistors 370a
Thermometers
Dial 56
Industrial R457b
Laboratory R457a
Remote reading R457c
Transmitters
Differential, pressure 148-149a
Pressure 148-149b
Temperature 148-149c
Vibration tester 222A
Varistors 370c
Viscometers LT395a
Instruments and controls.....64
Insulation 350K
Insulation
Asbestos, hy-temp 82b
Foamglas 293
85% magnesia 82a
Rigid block 130
Ion exclusion 348A
Jets, steam 282-283g
Joints, swing, ball bearing, catalog 400 .....L358
Kettle and condenser resin electro-vapor 106-107h
Kettles, lead 106-107g
Kilns, rotary, bulletin 115.....19
Laboratory ware, platinum 317
Lighting fixtures, explosion-proof..304-305
Liners, drum, polyethylene.....T310
Linings, brick 282-283e
Loaders, tracto-shovel 433a
Loading ramp 210A
Magnets 141a
Materials handling 354E
Materials handling, car loading.....352K
Materials of construction
Alloys, hard facing.....218
Aluminum bronzes 44-45
Cements, corrosion-proof, bulletin 5-2 280
Copper 367
Gold 128b
Industrial plastics 287
Nickel alloys, monel 65
Platinum 128a
Silver 128c
Steel 156
Steel, stainless 410
Steel, stainless, No. 20.....347
Teflon L422
Meter, industrial fluid.....214E
Mist eliminators, knitted wire mesh...290
Mixing equipment
Agitators 142f
Agitating equipment 328
Blenders, dry 142b
Mixers
Bulletin TAK-2 .....B302
Carbon paste 144a
Laboratory 207e
Laboratory, counter-rotating TL395b
Mullers, bulletin 509 22-23
Portable 142a
Portable, electric and air driven..207d
Ribbon 142c
Side entering 142e, 207c
Top entering, propeller-type....207b
Top entering, turbine & paddle types 207a
Turbine 211
Propellers TL457
Motors
Chemical, electric, TEFC, bulletin GEA-4400 393
Electric
Bulletin B-2101 279
Bulletin 51B6052 273
Explosion-proof 80, 402-403
Fluid drive 475
Protected type 16
Fractional hp. variable speed.....216F
Nails, rivets & screws, corrosion resistant T427
Nozzles 350D
Nozzles
Spray BR353
Spray, catalogs 6A & 6C.....L428
Ozonators 430a
Packaging equipment, bag closing machine, bulletin 200 .....T302
Packaging material, interior.....36
Packers, vibrating 275c
Pallets, fiber 210E
Paper, photographic, for drawing reproduction 79
Pipe & fittings 352B
Pipe & fittings, glass, pyrex.....150-151a
Pipe & tubing, stainless, welded or seamless L400
Pipe anchor, underground 209A
Pipe
Fittings & valves.....282-283d
Industrial vent, asbestos-cement....326
Plastic 348K, 411
Stainless steel, schedule 5.....458
Steel, saran lined 234
Steel, saran rubber lined.....344
Pipe systems B320
Piping
Chemical, polyethylene 213
Materials, corrosion resistant....TL443
Porcelain specialities, high temperature R358
Precipitators, electrostatic 50, 352H
Processing equipment, high vacuum..366
Pumps 354C
Pumps
Acid 257
Acid, bulletins P/1 and 100B.....267
Air-operated displacement 214B
Centrifugal 214D, 282-283c
Centrifugal
General purpose 425
Multi-stage 100c
Self-priming 53
Chemical, vertical, bulletin V-837..350
Close-coupled 14b
Diaphragm TR353
Double suction 14a
For lube and vegetable oils.....350H
Gas, rotary positive.....377c
General service, type CS.....100d
Industrial line 348D
Metering & proportioning.....362
Multi-stage 14c
Non-agitating, centrifugal, catalog 250 99
Positive displacement, controlled volume 311
Power, triflex plunger type.....100e
Process
Centrifugal, type ES.....100b
Centrifugal, type ESC.....100a
Type P, with interchangeable seal, bulletin 52B6615 68
Rotary 212A, 256
Rotary, bulletin 53SC.....L443
Rubber lined 348J
Screw, bracket type 336
Single stage, double suction.....386
Steam, duplex piston type 100f
Stock, type CS, bulletin 1100.....297
Type G, bulletin WQ-213.....338
Vacuum 263
Vacuum, cycloidal 377f
Vertical, abrasive corrosive slurries, bulletin 203-6 327
Raceway, rigid steel, dekoron-coated..135
Rectifiers, mechanical, bulletin 5205 412-413
Refractories
Silicon carbide 389
Silicon carbide, bulletin B-749....B308
Refrigeration equipment, mechanical cooling systems 464
Refrigeration systems 361
Reforming plant 354P
Regulator, acetylene 216E
Respirators, twin cartridge 18
Safety equipment, gas masks.....352M
Safety heads 41
Scales, crane, electronic brochure M-2 .....LB395
Screen cloth, bulletin No. 113-A1 356-357
Screens, dewatering, continuous paddle T314
Screens, vibrating 275f
Seals, mechanical, type 9.....334
Separators 141b, 348M, 350Q, 354F
Separators, magnetic L424
Sheets, plastic 350J
Sifter, circle, bulletins 06B7633 and 06B7625 87
Speed reducers, worm gear.....350I, 438
Spray gun
Electrostatic type 218B
Self contained 218A
Starter, explosion proof 216A
Steel 350P
Switchgear, metal-clad 95
Switchgear, metal-clad, type DH.....91
Switch, waterproof 216B
Tank cars 67b
Tanks, storage 67a
Tantalum 318
Titrators, automatic, data file 43-14..L355
Tools, hand, packing remover.....B310

Towers
Absorption, fractionation and scrubbing 282-283h
Atmospheric, three stage 381
Bleaching or absorption, alloy 277a
Cooling induced draft 59
Cooling, water 9
Tractors, industrial wheel 433b
Trailer, hopper car 210F
Trailers, platform 85
Transformer 216C
Transmissions, fluid power 26
Traps
Steam 93
Steam, bulletin 145-A 379
Steam, freeze-proof, bulletin 152 .. B222
Trays, grid 39
Trucks, fork 132, 210C
Tube cleaners, bulletin TW-1046 260
Tubes
Condenser 365
Condenser, plain & finned 391
Flow, bulletin FT-101 ..... R400
Tubing
Alloy 269
Flexible plastic 102
Seamless & welded 28-29
Stainless 352T
Stainless steel 404
Teflon 348G
Turbines
Geared, steam, bulletin H-19 24-25
Mechanical-drive, bulletin GEA-4955A 146-147
Steam, bulletin 135 34
Type E, book B-3896 289
Vacuum tools 258
Valves 76, 354M
Valves
Bar stock 129
Bronze 380a
Cast steel 380c
Check, tilting disc 301
Control 38
Forged steel 380d
Gate
Bronze, iron & steel 461a
Cast steel, double revolving disc 48a
Cast steel, slotted wedge 48b
Globe, aluminum 461b
High pressure control 214C
Iron 380b
Lubricated plug 299
Plug gate 245
Porcelain 215
Pressure reducing 239
Proportional, series 700, bulletin 700-2 52
Regulators 333
Solenoid, electric L363
Stainless steel 341
Stainless steel, gate 439
Swing check 461c
Water level control, float operated .. 323
Vessels, reactors, glassed steel, bulletin 894-P-1 476
Vulcanizers, jacketed 106-107c
Water treatment
De-ionizer, two-bed 46
Demineralizers 295
Demineralizers, mixed bed 285
Demineralizers, single unit tank ... B322
Weighing system, conveyor belt 210D
Wire cloth 352N
Wood 350S

SERVICES

Engineering & construction 117
Engineering & construction
Heavy chemical plants 37
Nitric acid plants 72
Process plants 407
Maintenance cleaning, chemical 219
Prototype development, process equipment 261
Tank storage terminals 249
Testing 354J

Use This Handy Postcard to Help You in Keeping Up-to-Date

Circle numbers of desired items, fill in reverse side, tear out and mail

CHEMICAL ENGINEERING: Send me more information about . . . (Card expires April 15.)

. . . Items in this Reader Service section as circled below:

2																			
6	36	60-61f	88b	109	135	153	216B	227	249	280	T302	327	348G	350Q	BR353	R363	385	406	433b
8-7	37	60-61g	88c	111	136	154	216C	228A	250-251	281	B302	328	348H	350R	384	395	386	407	434
9	38	62	89	115a	137	155	216D	229A	253	282-283a	303	329	348I	350S	354A	396	L387	408	435
1	39	63	90	115b	140	156	216E	229B	255	282-283b	304-305	330	348J	351a	354B	397	R387	410	R436
0	40	64	91	115c	141a	207a	216F	229C	256	282-283c	306	331	348K	351b	354C	399	L388	411	437
1	41	66	92	115d	141b	207b	217	230A	257	282-283d	T308	332	348L	351c	354D	370a	R388	413-415	438
2	42	67a	93	115e	142a	207c	218	230B	258	282-283e	B308	333	348M	352	354E	370b	389	414	439
3	43	67b	94	115f	142b	207d	218A	230C	T259	282-283f	309	334	348N	352A	354F	370c	390	416	440
4a	44-45	68	95	115g	142c	207e	218B	230D	B259a	282-283g	T310	T335	348O	352B	354G	371	391	R417	441-442
4b	46	69-70	96	115h	142d	208A	219	231	B259b	282-283h	B310	B335	348P	352C	354H	372	392	418	TL443
4c	47	71	97	117	142e	209A	220A	232	260	282-283i	311	336	348Q	352D	354I	373	393	419	TR443
5	48a	72	99	119a	142f	209B	221	232A	261	282-283j	T312	337	349	352E	354J	378a	394	L422	TL456
6	48b	73	100a	119b	144a	210A	T222	233	262	285	B312	338	350	352F	354K	378b	TL395a	R422a	BL456
7	49	74	100b	119c	144b	210B	B222	234	263	286a	T314	339	350A	352G	354L	378c	TL395b	R422b	R456
8	50	76	100c	120	144c	210C	222A	234A	265	286b	B314	341	350B	352H	354M	377a	BL395	423	TL457
9	51	77	100d	121	145	210D	223	234B	267	287	315	T342	350C	352I	354N	377b	R395	L424	BL457
0	52	78	100e	122	146-147	210E	224A	234C	269	288	317	B342	350D	352J	354O	377c	396a	R424	R457a
1	53	79	100f	123	148-149a	210F	224B	235	271	289	318	343	350E	352K	354P	377d	396b	425	R457b
2-23	54	80	101	124	148-149b	211	225	236	273	290	319	344	350F	352L	354Q	377e	397a	426	R457c
4-25	55	81	102	125	148-149c	212A	226a	236A	275a	291	T320	345	350G	352M	L355	377f	397b	T427	458
26	56	82a	105	127	148-149d	212B	226b	236B	275b	292	B320	346	350H	352N	B355	379	398	B427	459
27	57	82b	106-107a	128a	148-149e	213	226c	236C	275c	293	321	347	350I	352O	356-357	380a	L399	L428	460
28-29	58	83	106-107b	128b	148-149f	214A	226d	236D	275d	294	T322	348	350J	352P	L358	380b	R399	BR428	461a
30	59	84a	106-107c	128c	148-149g	214B	226e	237	275e	295	B322	348A	350K	352Q	R358	380c	L400	430a	461b
31	60-61a	84b	106-107d	129	150-151a	214C	226f	238	275f	296	323	348B	350L	352R	T360	380d	R400	430b	461c
32-33a	60-61b	85	106-107e	130	150-151b	214D	226g	239	277a	297	T324	348C	350M	352S	B360	381	401	431	464
32-33b	60-61c	86	106-107f	131	150-151c	214E	226h	244	277b	299	B324	348D	350N	352T	361	382-383	402-403	L432	475
34	60-61d	87	106-107g	132	152a	215	226A	245	278	300	325	348E	350O	L353	362	384a	404	R432	476
35	60-61e	88a	106-107h	133	152b	216A	226B	246	279	301	326	348F	350P	TR353	L363	384b	405	433a	

. . . Items in the Reader Service "Flashback" Section (p. 472)

206A	207C	210A	212D	215B	220B	222C	225A	227C	228C	232B	320B	320G	320L	320Q	322B	322G	322L	322Q	322V
206B	207D	210B	212E	215C	221A	222D	226A	227D	228D	234A	320C	320H	320M	320R	322C	322H	322M	322R	322W
206C	208A	210C	214A	219A	221B	222E	226B	227E	228E	235A	320D	320I	320N	320S	322D	322I	322N	322S	322X
206D	208B	212A	216A	219B	222A	224A	227A	228A	230A	236A	320E	320J	320O	320T	322E	322J	322O	322T	322Y
207A	208C	212B	216B	220A	222B	224B	227B	228B	232A	320A	320F	320K	320P	323A	322F	322K	322P	323U	322Z
207B	208D	212C	218A																

. . . Send me these reprints, I will remit on receipt. (See last Reader Service Page for descriptions.)

1 2 4 5 6 7 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22a 22b 23 24 25 26 27 28 29

Flashback . . .

To make sure that you don't miss any news that could help you with your job, Chemical Engineering is doing a double take for you. The listings on this and the following page is a repeat of the editorial listings only on chemicals, equipment and services featured last month in the New Equipment, New Products and New Technical Literature departments. Use the postcard below for more information on any item in this list.

CHEMICALS

Adhesives
- Vinyl plastics 230A
- Vinyl Pyridine latex 232B

Alkyl phosphites 227A
Ceramic, bubble caps.....228E
Coatings
- Liquid plastic 228D
- Phosphate 236A
- Protective 322H
- Tetrafluoroethylene 228B

Decontaminator, radioactivity 228A
Disinfectant, seeds 235A
Drying oil 227D
Dyes 322B
Fluorine compounds 322N
Herbicide 226A
Hydrogen peroxide, cellulose
- treating 322U

Insecticides 234A
- Lindane 232A

Methacrylic acid 227B
Oil, tall 320T
Organics, synthetic 320O
Paints
- Corrosion resistant 322S
- Latex 320D

Pentachlorophenol 226B
Reagents 322R
Resins
- Gum formula 322P
- Thermosetting 227E

Solvents, high boiling 228C
Tertiary-butylamine 227C

EQUIPMENT

Air handling equipment
- Dampers 322E
- Dehumidifiers 322A

Bearing, nylon sleeve.....225A
Blenders, dry, twin-shell 320C
Burner, oil 220B
Cable troughs 322F
Compressors
- Air 206A
- Recifirocating 320G
- Analog 320F

Conveyor
- Car loading 218C
- Unloading 214A

Disintegration equipment, crushers..320K
Fabricators, metal 320Q
Faucet, drum 206B
Filters 322X
Fittings
- Cast iron 322T
- Heat exchanger tee.....221A

Fork truck, heavy duty.....219B
Fuses, high voltage.....224A

Two Postcards—To help you in keeping up-to-date

Chemicals, Equipment, Services, Reprints. Directions on the other side.

Chemical Engineering's Reader Service Postcard

Name _____

Position _____

Company _____

Address _____

City & State _____

PLACE
3¢ STAMP
HERE

CHEMICAL ENGINEERING
READER SERVICE DEPARTMENT
330 WEST 42nd ST.
NEW YORK 36, N. Y.

Heater, Immersion 220A
Heaters, submerged combustion ...320A
Instruments
Air filter & regulator.....212C
Air meter 210C
Alternator frequency control.....212B
Control 322I
Gas alarm 210B
Gas analyzer 210A
Infrared analyzer 322M
Measuring 322D, 322V
Miniature graphic panel.....322L
Portable pH meter.....212A
Protector system, carbon monoxide 320P
Radiation detection 320S
Smoke indicator 212E
Temperature transmitter 212D
Materials handling
Conveyor belts 322Z
Magnesium dockboards 322K
Mechanical goods, complete line....322Y
Mixer, drum 207B
Mixer-Homogenizer 208D
Motor, Electric 222D
Nozzle, sparger 221B
Packing rings, hydraulic 222A
Packings, glands, midget.....320I
Panel, circuit breaker.....224B
Pipe & fittings.....322Q
Pipeline equipment 322G
Power systems, hydraulic 320J
Precipitator, electrostatic 322W
Pumps
Chemical 206D
Multiple 208B
Rotary 322O, 320R
Selftriming, centrifugal 320B
Safety equipment, tire extinguishers 320N
Safety manual 320E
Scales, balance, analytical.....320H
Scrubber, gas 208A
Sheave, variable pitch 222B
Shelter, loading dock 216A
Speed reducers, wormgear 322J
Sweeper, motorized 222E
Tank cover 207A
Traps, steam 320L
Truck
Fork 218B
Fork stand-up 216B
Pallet 218A
Tiering 219A
Tuking, flexible 320M
Valve
Angle style toggle 206C
Plug 207D
Sanitary motor 208C
Solenoid 207C
Tester 222C

SERVICES

Engineering & construction process plants 322C

Two Postcards—One for you, one to pass along

Circle numbers of desired items, fill in reverse side, tear out and mail

CHEMICAL ENGINEERING: Send me more information about . . . (Card expires April 15.)

. . . Items in this Reader Service section as circled below:

2	36	60–61f	88b	109	135	153	216B	227	249	280	T302	327	348G	350Q	BR363	R363	385	406	433b
6–7	37	60–61g	88c	111	136	154	216C	228A	250–251	281	B302	328	348H	350R	354	365	386	407	434
8	38	62	89	115a	137	155	216D	229A	263	282–283a	303	329	348I	350S	354A	366	L387	408	435
9	39	63	90	115b	140	156	216E	229B	255	282–283b	304–305	330	348J	351a	354B	367	R387	410	R436
10	40	64	91	115c	141a	207a	216F	229C	256	282–283c	306	331	348K	351b	354C	369	L388	411	437
11	41	66	92	115d	141b	207b	217	230A	257	282–283d	T308	332	348L	351c	354D	370a	R388	412–413	438
12	42	67a	93	115e	142a	207c	218	230B	258	282–283e	B308	333	348M	352	354E	370b	389	414	439
13	43	67b	94	115f	142b	207d	218A	230C	T259	282–283f	309	334	348N	352A	354F	370c	390	416	440
14a	44–45	68	95	115g	142c	207e	218B	230D	B259a	282–283g	T310	T335	348O	352B	354G	371	391	R417	441–443
14b	46	69–70	96	115h	142d	208A	219	231	B259b	282–283h	B310	B335	348P	352C	354H	372	392	418	TL443
14c	47	71	97	117	142e	209A	220A	232	260	282–283i	311	336	348Q	352D	354I	373	393	419	TR443
15	48a	72	99	119a	142f	209B	221	232A	261	282–283j	T312	337	349	352E	354J	375a	394	L423	TL455
16	48b	73	100a	119b	144a	210A	T222	233	262	285	B312	338	350	352F	354K	375b	TL395a	R423a	BL455
17	49	74	100b	119c	144b	210B	B222	234	263	286a	T314	339	350A	352G	354L	375c	TL395b	R423b	R456
18	50	76	100c	120	144c	210C	223A	234A	265	286b	B314	341	350B	352H	354M	377a	BL395	433	TL457
19	51	77	100d	121	145	210D	223	234B	267	287	315	T342	350C	352I	354N	377b	R395	L434	BL457
20	52	78	100e	122	146–147	210E	224A	234C	269	288	317	B342	350D	352J	354O	377c	396a	R434	R457a
21	53	79	100f	123	148–149a	210F	224B	235	271	289	318	343	350E	352K	354P	377d	396b	435	R457b
22–23	54	80	101	124	148–149b	211	225	236	273	290	319	344	350F	352L	354Q	377e	397a	436	R457c
24–25	55	81	102	125	148–149c	212A	226a	236A	275a	291	T320	345	350G	352M	L355	377f	397b	T427	458
26	56	82a	105	127	148–149d	212B	226b	236B	275b	292	B320	346	350H	352N	R355	379	398	B427	459
27	57	82b	106–107a	128a	148–149e	213	226c	236C	275c	293	321	347	350I	352O	356–357	380a	L399	L428	460
28–29	58	83	106–107b	128b	148–149f	214A	226d	236D	275d	294	T322	348	350J	352P	L355	380b	R399	BR428	461a
30	59	84a	106–107c	128c	148–149g	214B	226e	237	275e	295	B322	348A	350K	352Q	R355	380c	L400	430a	461b
31	60–61a	84b	106–107d	129	150–151a	214C	226f	238	275f	296	323	348B	350L	352R	T360	380d	R400	430b	461c
32–33a	60–61b	85	106–107e	130	150–151b	214D	226g	239	277a	297	T324	348C	350M	352S	B360	381	401	431	464
32–33b	60–61c	86	106–107f	131	150–151c	214E	226h	244	277b	299	B324	348D	350N	352T	361	382–383	402–403	L432	475
34	60–61d	87	106–107g	132	152a	215	226A	245	278	300	325	348E	350O	L353	362	384a	404	R432	476
35	60–61e	88a	106–107h	133	152b	216A	226B	246	279	301	326	348F	350P	TR353	L363	384b	405	433a	

. . . Items in the Reader Service "Flashback" Section (p. 472)

206A	207C	210A	212D	218B	220B	222C	226A	227C	228C	232B	320B	320G	320L	320Q	322B	322G	322L	322Q	322V
206B	207D	210B	212E	218C	221A	222D	226A	227D	228D	234A	320C	320H	320M	320R	322C	322H	322M	322R	322W
206C	208A	210C	214A	219A	221B	222E	226C	227E	228E	235A	320D	320I	320N	320S	322D	322I	322N	322S	322X
206D	208B	212A	216A	219B	222A	224A	227A	228A	230A	236A	320E	320J	320O	320T	322E	322J	322O	322T	322Y
207A	208C	212B	216B	220A	222B	224B	227B	228B	232A	330A	320F	320K	320P	322A	322F	322K	322P	322U	322Z
207B	208D	212C	218A																

. . . Send me these reprints, I will remit on receipt. (See last Reader Service Page for descriptions.)

1 2 4 5 6 7 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22a 22b 23 24 25 26 27 28 29

More Help for You . . .

It's fast. It's easy. Chemical Engineering's Reader Service will bring you reprints too. You can use the postcard to get up-to-date data on processes, equipment, technology.

Now Ready . . .

Chemical Engineering's Reprint 29

Materials of Construction—the 15th Biennial Report—to help engineers in their never-ending fight against corrosion. This report dispels some of the confusion surrounding protective coatings and their proper use $1

Every Month . . .

This list will help to keep you posted as to what's available for your files. The postcard makes it convenient to order.

1 **Chemical Engineering's Flowsheets**—150 flowsheets of industrial processes. ($1.50).
2 **Data & Methods for Cost Estimation**—38 articles, 128 pages . . . equipment, plants, operations. ($1.75).
4 **Fluid Flow**—Fifteen authoritative articles. ($1).
5 **Water Problem**—What it means to chemical process industries. (50¢).
6 **Fire Prevention**—Developments and trends. (50¢).
7 **Middle Atlantic States**—A survey and census. (50¢).
9 **Product Development**—Basic approaches, examples. (50¢).
10 **Crystallization**—Equipment and methods. (50¢).
11 **Materials of Construction**—14th biennial report . . . with directory of materials and manufacturers. ($1).
12 **Computers**—What high-speed automatic computers are and how they can be used. (50¢).
13 **Solvent Extraction of Oilseeds**—Process principles and product purification. (50¢).
14 **Organic Unit Processes**—Recent advances. (50¢).
15 **Glass**—How and why it's used in process plants. (50¢).
16 **Motors & Motor Control**—Types, costs. (50¢).
17 **Sublimation**—Equipment techniques, theory. (50¢).
18 **Agglomeration**—Methods and equipment. (50¢).
19 **New Processing Tools**—Trends and developments in equipment, techniques. (50¢).
20 **Plant Defense**—Control disaster by enemy attack, espionage. (50¢).
21 **Pumps**—Classification and characteristics . . . chemical pumps . . . how to select. (50¢).
22 **Process Instrumentation**—48-p. report, 16-p. folded chart . . . principles, advances, selection. ($1).
22a **Process Instrumentation**—48-p. report . . . economics selection, push-button plants. (75¢).
22b **Process Instrumentation**—16-p. chart Guide to Process Instrumentation Elements. 350 instruments. (35¢).
23 **Liquid-Liquid Extraction**—Equipment, performance and characteristics . . . solvents. (50¢).
24 **Builders of the Chemical Century**—The people who have made chemical engineering in the U. S. . . . industry problems of the future. ($1).
25 **Size Reduction**—Selection of crushing, grinding and pulverizing equipment. (50¢).
26 **Petrochemical Processes**—Flowsheets and descriptions of 23 major processes. (50¢).
27 **Adsorption**—What it can do, its mechanism, latest design practice, expectations for the future. (50¢).
28 **Solids Feeders**—How to lick feeding difficulties with solids and semi-solids. (50¢).
29 **Materials of Construction**—How to evaluate, select, test and use protective coatings. ($1).

Order C.O.D.:

The directions of the other side of the postcard make ordering simple.

Chemical Engineering's Reader Service Postcard

Name _____

Position _____

Company _____

Address _____

City & State _____

PLACE
3¢ STAMP
HERE

CHEMICAL ENGINEERING
READER SERVICE DEPARTMENT
330 WEST 42nd ST.
NEW YORK 36, N. Y.

Master Fluid Drive units make use of a fluid coupling so designed that it can be interposed easily between the motor shaft and the output shaft (or motor shaft and first stage of gears of a gear-motor). Use Master Fluid Drive Motors and gain these advantages.

SMOOTH ACCELERATION. With the fluid drive, the load is gradually accelerated . . . no sudden jerk at starting.

FULL POWER. Since there is no load on the motor when it starts, it very rapidly attains full running speed and the duration of the starting current inrush is greatly reduced.

CUSHION EFFECT. Provides cushioned starting . . . protects motors, gears, and driven equipment from damage from severe shock loads.

WIDE APPLICATION. Fluid Drive Motors are ideal for high inertia applications where it takes a long time to bring the load up to speed . . . for starting crane travel drives without jerking and swinging the load . . . for conveyor drives especially where they are handling fragile material . . . for agitators, textile machinery, presses, extruders, winding machinery, food machinery, laundry machinery, ball mills, calenders, machines, etc.

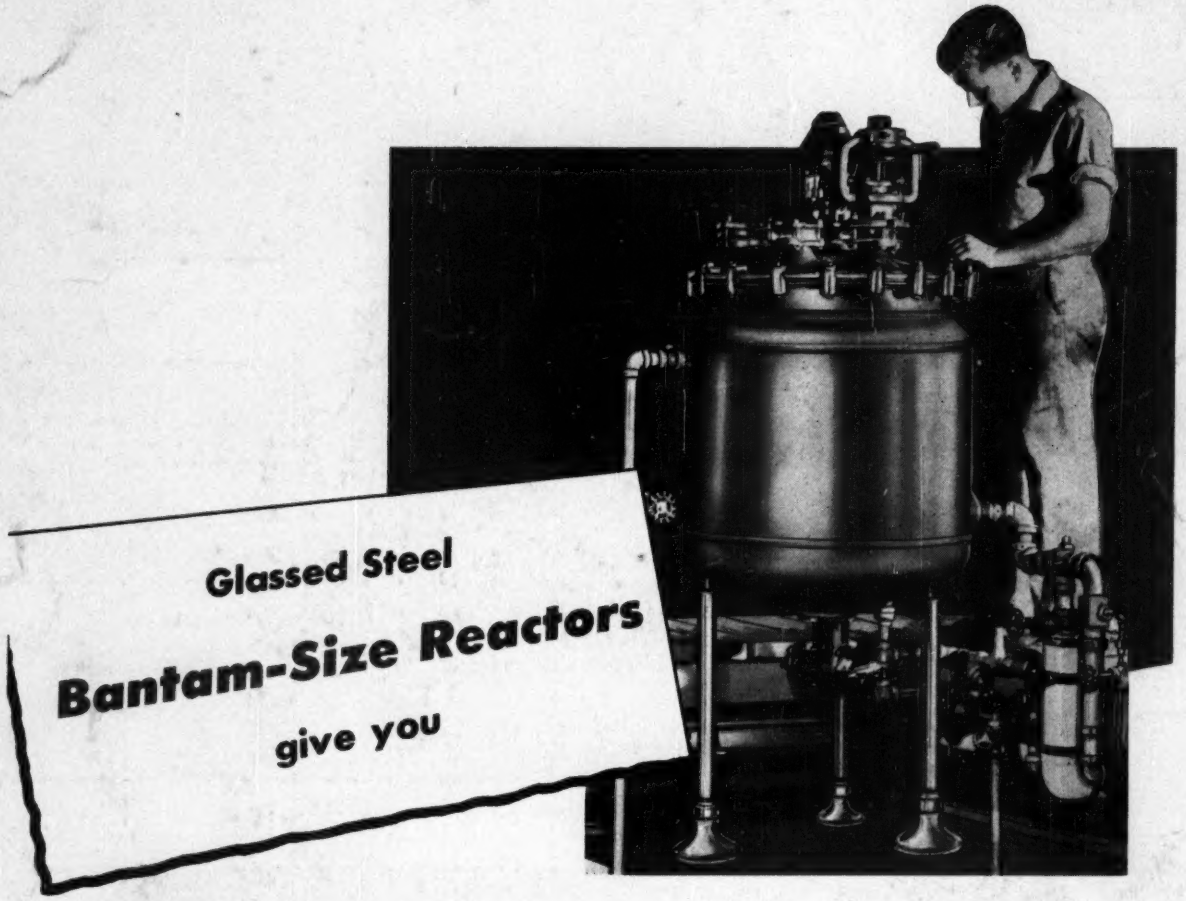
cushioned power

SIZES. Master Fluid-Drive Motors are available in sizes approximately ½ to 15 horsepower.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO

MASTER

FLUID DRIVE MOTORS



Glassed Steel

Bantam-Size Reactors

give you

the corrosion resistance of glass *plus* the working strength of steel

Pfaudler bantam-size "P" Series reactors make possible the transfer of a process from the laboratory to the pilot plant to full-scale production under parallel operating conditions. They are also widely used for processing small batches of rare or expensive products where purity is a prime consideration.

Built in standard capacities of 5, 10, 20, 30, 50, and 100 gallons, "P" Series reactors incorporate the same design features and have the same type of agitation as larger Pfaudler vessels. Depending on size, they are suitable for internal pressures from 25 to 35 p.s.i. and for jacket pressures from 75 to 110 p.s.i. Higher pressures are possible with special designs.

Glassed steel vessels for severe chemical service are built in capacities as large as 8300 gallons and are supplemented by a complete line of glassed steel pipe, fittings, and valves.

Glassed steel is resistant to *all* acids except hydrofluoric, even at elevated temperatures and pressures. With a new Pfaudler glass, it is possible to process not only with acids but also with *alkaline* solutions up to a pH of 12 and 212°F.

To give it working strength, Pfaudler glass is fused to steel in huge furnaces at temperatures of 1500-1700°F. *This high temperature firing locks the glass to the steel and makes it hard and tough.*

Write for Bulletin 894-P-1, our new general catalog on chemical processing equipment.

PFAUDLER THE PFAUDLER CO., ROCHESTER 3, N. Y.

Engineers and fabricators of corrosion resistant process equipment since 1884

Factories at: Rochester, N. Y.; Elyria, Ohio; Leven, Fife, Scotland; Schwetzingen-Baden, Germany